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Rainbow and Bull Trout Recruitment

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FISHERY RESEARCH

KOOTENAI RIVER FISHERIES INVESTIGATIONS: RAINBOW AND BULL TROUT RECRUITMENT

ANNUAL PROGRESS REPORT
April 1, 2002 — March 31, 2003

Prepared by:

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IDFG Report Number 04-02
January 2004

Kootenai River Fisheries Investigations: Rainbow and Bull Trout Recruitment

Project Progress Report

2002 Annual Report

By

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ABSTRACT

Rainbow trout *Oncorhynchus mykiss* provide the most important sport fishery in the Kootenai River, Idaho, but densities and catch rates are low. Low recruitment is one possible factor limiting the rainbow trout population. Bull trout *Salvelinus confluentus* also exist in the Kootenai River, but little is known about this population. Research reported here addresses the following objectives for the Kootenai River, Idaho: increase rainbow trout recruitment, identify rainbow and bull trout spawning tributaries and migration timing, establish baseline data on bull trout redd numbers in tributaries, and improve the rainbow trout population size structure. Six adult rainbow trout were moved to spawning habitat upstream of a potential migration barrier on Caboose Creek, but numbers of redds and age-0 out-migrants did not appear to increase relative to a reference stream. Measurements taken on the Moyie River indicated the gradient is inadequate to deliver suitable flows to a proposed rainbow trout spawning channel. Summer water temperatures measured in the Deep Creek drainage sometimes exceeded 24°C, higher than those reported as suitable for rainbow trout. Radio-tagged rainbow trout were located in Boulder Creek during the spring spawning season, and bull trout were located in the Moyie River and O'Brien Creek, Montana in the fall. Bull trout spawning migration timing was related to increases in Kootenai River flows. Bull trout redd surveys documented 19 redds on Boulder Creek and North and South Callahan creeks. Fall 2002 electrofishing showed that the Kootenai River rainbow trout proportional stock density was 54, higher than prior years when more liberal fishing regulations were in effect. Boulder Creek produces the highest number of age-0 rainbow trout out-migrants upstream of Bonners Ferry, but the survival rate of these out-migrants upon reaching the Kootenai River is unknown. Determining juvenile survival rates and sources of mortality could aid management efforts to increase rainbow trout recruitment. North and South Callahan creeks support the largest spawning population of bull trout in the Kootenai River drainage, Idaho, so management of the watershed should consider bull trout as high priority.

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INTRODUCTION

The Kootenai River in Idaho has recently lost fisheries for several species including white sturgeon *Acipenser transmontanus*, burbot *Lota lota*, and kokanee *Oncorhynchus nerka* (Richards 1997). The mountain whitefish *Prosopium williamsoni* population has also declined since the early 1980s (Partridge 1983; Paragamian 1995a, 1995b; Downs 2000; Walters and Downs 2001). Although no rainbow *O. mykiss* or westslope cutthroat trout *O. clarki lewisi* population data exist prior to 1980, these populations also appear depressed based on catch rates. Angler catch rates of trout (rainbow and westslope cutthroat) for the Kootenai River, Idaho were 0.06, 0.03, 0.21, and 0.14 fish/h in 1982, 1993, 2001, and 2002, respectively (Partridge 1983; Paragamian 1995a; Walters 2003; Idaho Department of Fish and Game [IDFG] unpublished data). These rates are low when compared to the Kootenai River, Montana where trout catch rates of 0.36 to 0.48 fish/h were reported for 1978 and 1979, respectively, the most recent year-round creel data for Montana (May and Houston 1979).

The rainbow trout density in the Idaho reach of the Kootenai River is an order of magnitude lower than in the Flower-Pipe reach of Montana. The average age-2 and older density in the Flower-Pipe reach was 662 trout/km for 1993, 1994, and 1999, while the density at the Hemlock Bar reach in Idaho for the same years averaged 47 trout/km (5 trout/ha and standing stock of 1.3 kg/ha) (Paragamian 1995a, 1995b; Downs 2000; Walters and Downs 2001; J. Dunnigan, MFWP, personal communication). Lower densities likely contribute to the lower angler catch rates in Idaho. Despite low densities and catch rates, rainbow trout provide the most important fishery in the Kootenai River, Idaho (Paragamian 1995a).

The low rainbow trout densities in Idaho are hypothesized to result from limited juvenile recruitment to the Kootenai River mainstem (Partridge 1983; Fredericks and Hendricks 1997). The Deep Creek drainage produces about 40,000 rainbow trout juvenile out-migrants to the Kootenai River annually, more than the rest of the Idaho tributaries combined (Downs 1999, 2000; Walters and Downs 2001; Walters 2002, 2003). However, juvenile rearing densities in the Deep Creek mainstem are low (7.8 fish/100 m^2) relative to high densities (up to 109 fish/100 m^2) in several Deep Creek tributaries (Fredericks and Hendricks 1997). High summer water temperatures were suggested as one factor limiting juvenile rearing densities in the Deep Creek mainstem (Fredericks and Hendricks 1997). Water temperature data are still lacking for the drainage.

Rainbow trout recruitment from tributaries upstream of Deep Creek is low, with an estimated maximum of about 15,000 juvenile (mainly age-0) recruits to the Kootenai River annually (Walters 2002, 2003; IDFG unpublished data). The majority of this recruitment is from Boulder Creek (Walters 2002, 2003), though Partridge (1983) stated that this stream has poor spawning conditions due to large substrates and embedded gravels. Boulder Creek also has a waterfall barrier, restricting fluvial trout to the lower 2 km of the stream. Caboose and Debt creeks produce age-0 recruits, but culverts on these streams may prevent some rainbow trout adults from reaching spawning habitat upstream (Partridge 1983; IDFG unpublished data). These streams also flow subsurface through alluvial fans by July, preventing age-0 rainbow trout from out-migrating (Walters 2003). The Moyie River is the largest Idaho tributary upstream of Bonners Ferry, but spawning habitat is limited due to large substrates and an upstream barrier (dam and natural falls) 2 km from the mouth (Partridge 1983). Partridge (1983) also noted that the main gravel bar was channelized by a landowner to prevent bank erosion. Increasing access to, or enhancing rainbow trout spawning and rearing habitat in, these tributaries may increase recruitment to the Kootenai River.

Additional trout recruitment to the Kootenai River, Idaho from Montana is likely (Downs 2000; Walters and Downs 2001; Walters 2003). Although juvenile out-migration from Montana tributaries has not been investigated, rainbow and bull trout radio-tagged in the Kootenai River, Idaho have been tracked to Montana tributaries during the spawning season (Walters and Downs 2001; Walters 2003). An increased sample size of radio-tagged trout may identify more Idaho and Montana spawning tributaries. Identification of spawning tributaries will help prioritize streams for habitat protection or enhancement.

Changes in Kootenai River flows and temperature are known to affect Kootenai River white sturgeon and burbot spawning migration timing (Paragamian 2000; Paragamian and Kruse 2001), but effects on rainbow and bull trout are unknown. If the altered hydrograph and change in water temperatures due to operations of Libby Dam negatively affect trout migration timing, this could also affect recruitment. More data are needed regarding the timing of trout spawning migrations in relation to flow and temperature.

Another possible factor limiting the Kootenai River rainbow trout population is angling exploitation. Annual exploitation rates of 58% and 46% were documented for 1999 and 2000, respectively (Walters and Downs 2001; Walters 2002). In response to these exploitation rates, more conservative regulations were initiated for the trout fishery. Beginning January 1, 2002, a 16” (406 mm) minimum length limit and two-fish bag limit was established for rainbow and westslope cutthroat trout in the Kootenai River, Idaho. The regulations through 2001 included no size limit and a six-fish bag limit for trout. The goals of the new regulations are to conserve the trout population for continued fishing opportunities, improve the population size structure, and increase trout densities by decreasing angler exploitation and protecting trout until they can spawn at least once. Continued monitoring of the trout population is necessary to evaluate the effects of the new regulations.

Bull trout in the Columbia River basin were listed in the Federal Register as a threatened species under the Endangered Species Act on June 10, 1998. Little is known about bull trout in the Kootenai River in Idaho. Tributary surveys have documented few bull trout, while about two/yr are caught during mainstem sampling (Partridge 1983; Paragamian 1995a, 1995b; Walters and Downs 2001; Walters 2002). More baseline information regarding bull trout spawning locations and recruitment sources is important to documenting recovery needs of this population.

GOALS

1. Provide a management plan to improve the rainbow trout fishery.

2. Achieve bull trout recovery targets for the lower Kootenai River as addressed in the draft bull trout recovery plan (U.S. Fish and Wildlife Service 2002).

OBJECTIVES

1. Increase rainbow trout recruitment to the Kootenai River, Idaho.

2. Identify rainbow and bull trout spawning tributaries

3. Collect baseline data on rainbow and bull trout spawning migration timing relative to Kootenai River flows and temperatures.

4. Collect baseline data on numbers of bull trout redds in Kootenai River tributaries in Idaho.

5. Improve the rainbow trout population size structure.

STUDY AREA

The Kootenai River (spelled Kootenay in Canada) flows south out of British Columbia into Montana, northwest into Idaho, then north back into British Columbia and Kootenay Lake (Figure 1). It flows out of the west arm of Kootenay Lake and enters the Columbia River at Castlegar, British Columbia. In the U.S., the Kootenai River is regulated by Libby Dam in Montana (Figure 1). There are approximately 105 km of Kootenai River in Idaho with the following three reaches: 1) the Canyon Reach (22 km) from the Montana border to the Moyie River, 2) the Braided Reach (10 km) from the Moyie River to Bonners Ferry, and 3) the Meandering Reach (73 km) from Bonners Ferry to the Canadian border (Fredericks and Hendricks 1997). The Meandering Reach has a relatively slow velocity and substrates consisting mainly of sand, silt, and clays (Partridge 1983). Dikes on either side of the river in this reach prevent flooding of the adjacent agricultural lands. The Braided and Canyon reaches upstream of Bonners Ferry appear more suitable for fluvial rainbow trout with riffles, runs, and pools, and gravel and cobble substrates. Work in 2002 occurred mainly in the Canyon Reach including the tributaries of Boulder, Caboose, Curley, and Debt creeks and the Moyie River. Sampling was also conducted in the Callahan and Deep creek drainages (Figure 1).

The Kootenai River in Montana upstream to Kootenai Falls is also accessible to fluvial and adfluvial trout. Kootenai Falls at river kilometer (rkm) 310 was a presumed migration barrier to upstream fish movement (Chapman and May 1986), but one bull trout has been documented moving upstream past the falls (M. Hensler, Montana Fish, Wildlife and Parks, personal communication). Major tributaries in Montana downstream of Kootenai Falls include O'Brien and Callahan creeks (Figure 1).

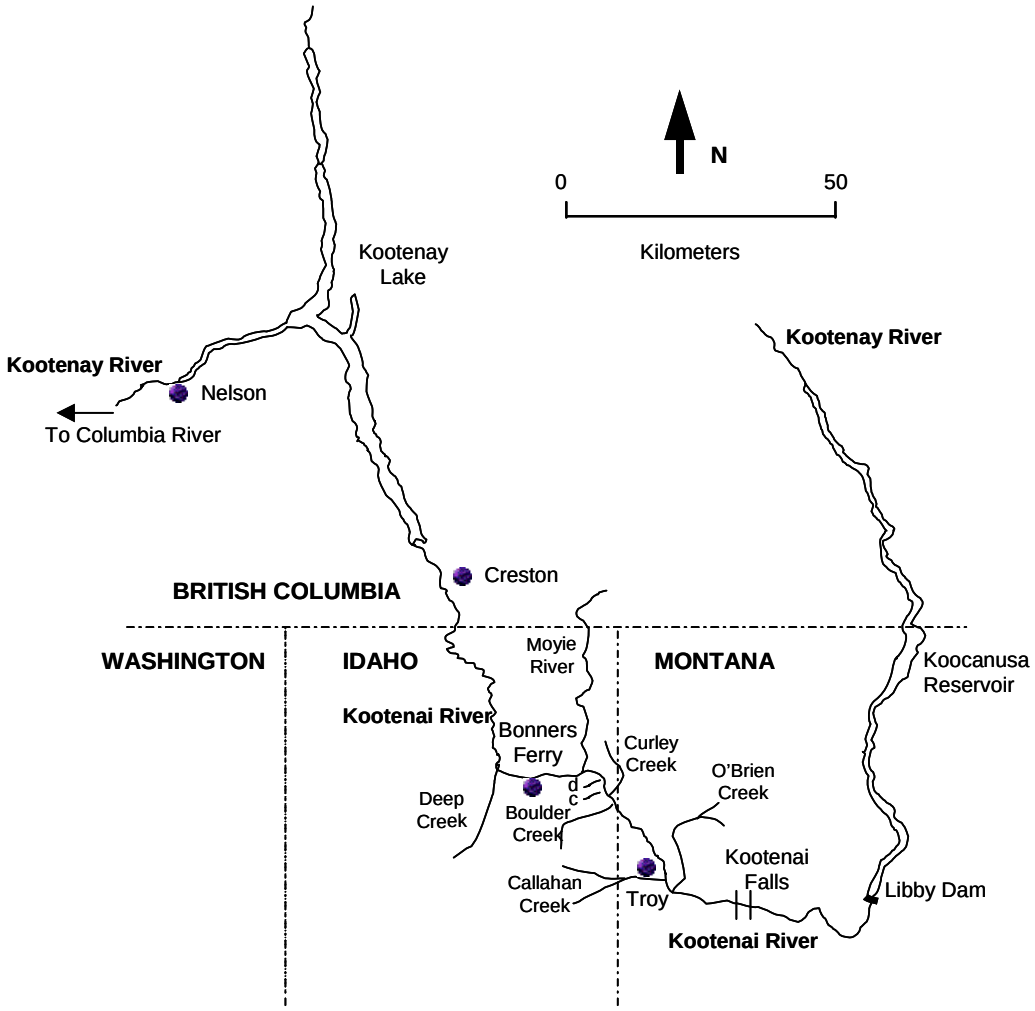

Figure 1. The Kootenai River drainage: "d" is Debt Creek and "c" is Caboose Creek.

METHODS

Rainbow Trout Recruitment

Several tasks were initiated to increase rainbow trout recruitment, determine feasibility for increasing recruitment, and measure recruitment. A weir was placed on Caboose Creek between the mouth and the railroad crossing culverts (two side-by-side culverts) upstream in order to trap rainbow trout ascending the creek to spawn. Because the railroad culverts are a possible upstream migration barrier (Partridge 1983, IDFG unpublished data), rainbow trout trapped at the weir were placed upstream of the culverts where they would have access to more spawning habitat. The weir was installed on April 25 and removed on June 25. Weir construction consisted of a conduit picket fence angled downstream with upstream and downstream trap boxes. All captured rainbow trout were measured (nearest mm total length [TL]) and weighed. If length was ≥120 mm TL (estimated to be ≥age-2), they were checked for evidence of sex, given a fin clip mark corresponding to the trap box in which they were caught, and then released upstream of the culverts if caught in the upstream trap box or downstream of

the weir if caught in the downstream trap box. Because the weir was breached by high water in May, a backpack electrofisher was also used to sample the plunge pool below the culverts for rainbow trout. These trout were also marked with a fin clip and released upstream of the culverts.

Rainbow trout redd surveys were conducted on Caboose and Debt creeks in May and June 2002. Streams were walked during midday from the mouth up to the first migration barrier upstream of the railroad culverts, distances of about 240 m on Caboose Creek and 600 m on Debt Creek. Disturbed gravel or cobble areas showing a pit and tailspill (Grost et al. 1991) were identified as rainbow trout redds. The redd surveys were conducted as one means of comparing potential rainbow trout production in Caboose Creek (treatment stream) versus Debt Creek (reference stream). Debt Creek was chosen as a reference because it was the most similar to Caboose Creek in terms of discharge, water temperatures, substrates, and aspect and size of the drainage (IDFG unpublished data). Debt Creek also has railroad culverts that are a possible upstream migration barrier (Partridge 1983, IDFG unpublished data).

Passive drift net sampling (Muth and Schmulbach 1984) was conducted on Caboose and Debt creeks to estimate the number of age-0 rainbow trout out-migrants (recruits to the Kootenai River) in summer as an index of relative production in the two streams. Drift net sampling occurred from June 25 through August 8. Drift net sampling methods and calculations of out-migrant estimates and confidence intervals were the same as described in Walters (2003).

In 2001, a feasibility study was done to determine if a spawning channel could be built on the lower Moyie River to increase rainbow trout recruitment to the Kootenai River (Walters 2003). The study determined that more Moyie River elevation measurements were needed during the rainbow trout spawning and egg incubation period. These measurements were made in 2002 using a transit level to measure difference in river elevation between the proposed spawning channel inlet and outlet. Measurements were taken approximately once/wk from March 27 through August 1. Drift net sampling to estimate the number of age-0 rainbow trout out-migrants was conducted from July 15 through August 8 on the Moyie River downstream of the proposed spawning channel site, and from June 25 through August 8 on Boulder Creek. This sampling was conducted to collect pretreatment data on numbers of age-0 rainbow trout out-migrants should the spawning channel be built. Boulder Creek is similar in terms of discharge and geomorphology, so it was chosen as a reference stream to compare to the Moyie River.

Optic StowAway® temperature data loggers were used to record summer and fall water temperatures every 4 h at six sites in the Deep Creek drainage. These sites were upstream and downstream of McArthur Lake (Table 1; Figure 2).

Table 1. Locations of temperature data loggers in the Deep Creek drainage, 2002. The GPS coordinates are for zone 11, and the datum = WGS84.

			GPS coordinates		
Stream	**Launch Date**	**Pull Date**	**Eastings**	**Northings**	**Location description**
Dodge Cr.	7/3/02	11/4/02	539900	5374586	Road Crossing 0.5 km upstream of McArthur Reservoir
Deep Cr.	7/3/02	11/1/02	539012	5371555	Road Crossing 1.4 km upstream of McArthur Reservoir
Deep Cr.	6/17/02	11/4/02	541600	5374478	0.5 km downstream of McArthur Reservoir
Deep Cr.	7/3/02	11/4/02	544711	5379296	Highway 95 bridge at Naples
Deep Cr.	7/3/02	11/1/02	544175	5382510	2nd bridge crossing on old Highway 95 north of Naples
Deep Cr.	7/3/02	11/1/02	545173	5386521	1st bridge north of the Deep Creek Inn

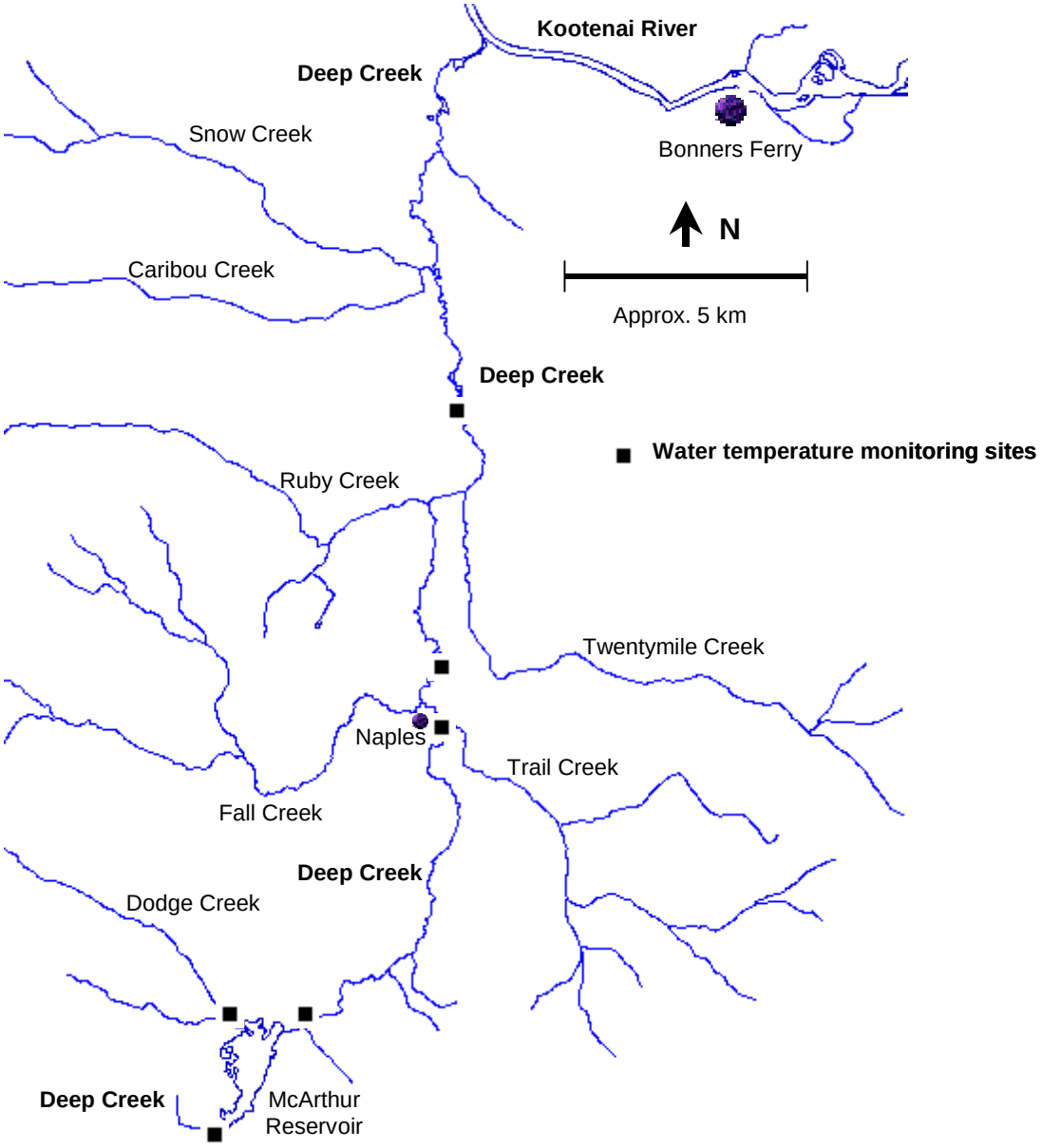

Figure 2. Water temperature monitoring sites in the Deep Creek drainage.

Rainbow and Bull Trout Spawning Tributary Identification and Migration Timing

Radio telemetry was used to identify Kootenai River spawning tributaries utilized by rainbow, westslope cutthroat, and bull trout and to determine migration timing relative to water temperatures and flows. All trout were collected using boat electrofishing on the Kootenai River from Bonners Ferry to Curley Creek (rkm 244.5-272) during April and May 2002, with the exception of one rainbow trout that was collected from the Caboose Creek weir. Electrofishing and telemetry methods were the same as described in Walters (2003). Three different radio transmitter types (Advanced Telemetry Systems, Inc.) were implanted into trout in 2002 (Table 2). Rainbow and bull trout tagged in previous years that still had active transmitters were

also monitored in 2002 (Walters and Downs 2001; Walters 2002; Walters 2003). The rainbow trout spawning season (including migration to and from spawning tributaries) was defined as March 1-June 30. The bull trout spawning migration period was defined as June 1-October 30.

Table 2. Approximate transmitter weights, duty cycles, and life expectancies for radio transmitters implanted into rainbow and bull trout in the Kootenai River, Idaho 2002.

Approximate transmitter weight (g)	Duty cycle	Life expectancy (d)
7.7	90 d on, 90 d off, on ~ 160 d	250
10.4	On every day	390
20.2	On every day	690

Bull Trout Redd Surveys

Bull trout redd surveys were conducted on Boulder, Curley, North Callahan, and South Callahan creeks and the Moyie River. Stream transects were hiked during midday to search for redds and spawning adults. Disturbed gravel or cobble areas showing a pit and tailspill were identified as bull trout redds (Shepard and Graham 1983; Dunham et al. 2001). Incidental sightings of kokanee and kokanee redds were also recorded. Kokanee redds were identified based on the presence of kokanee and the smaller substrates, which were mainly sand to pea-size gravel in size.

Rainbow Trout Population Size Structure

In fall 2002, electrofishing was used to sample the rainbow trout population size structure in relation to the new regulations. Rainbow trout were sampled while shocking along the riverbanks from Cow Creek (rkm 250) to Curley Creek (rkm 272). The rainbow trout were measured, weighed, and released. Rainbow trout catch-per-unit-effort, relative weights (W_r), proportional stock density (PSD), and quality stock density (QSD) were then calculated (Anderson 1976; Wege and Anderson 1978; Anderson and Neumann 1996). Relative weights were calculated for rainbow trout size groups of 201-305 mm TL, 306-406 mm TL, and >406 mm TL using the standard weight (W_s) equation for lotic rainbow trout populations proposed by Simpkins and Hubert (1996). Proportional and quality stock densities were calculated for rainbow trout >305 mm TL and >406 mm TL, respectively, using 200 mm TL as stock length (Schill 1991). A 95% confidence interval was estimated for the PSD using the table provided by Gustafson (1988), but equations were not available to estimate the confidence interval for the QSD.

RESULTS

Rainbow Trout Recruitment

Assessment of Moving Trout Upstream of Culverts

Three trout trapped at the Caboose Creek weir and three caught by electrofishing in the plunge pool below the culverts were given adipose fin clips and moved upstream of the culverts (Table 3). High water prevented fishing of the weir from May 21 through June 2, 2002. Two trout redds were found in Debt Creek, both upstream of the railroad culverts, while no redds were observed in Caboose Creek during spring 2002 (Table 4). An estimated 1,215 (95% CI = 662-1,768) age-0 rainbow trout out-migrated from Caboose Creek compared to 1,111 (95% CI = 1,015-1,207) that out-migrated from Debt Creek, based on the drift net sampling.

Table 3. Chronology of weir and electrofishing sampling on Caboose Creek, spring 2002. Rbt = rainbow trout, Rbt X Wct = rainbow and westslope cutthroat trout hybrid, Unk = unknown, M = male.

Date	Water temp. (°C)	Species caught	Total length (mm)	Weight (g)	Sex	Comments
4/25/2002	3.0					Weir installed
4/30/2002	6.0	Rbt			Unk	Fish escaped from trap box
5/12/2002	6.0	Rbt	496	984	Unk	
5/13/2002	5.5	Rbt	471	947	M	Implanted with radio tag, frequency 31.462
5/16/2002	6.0	Rbt	332	346	Unk	
5/20/2002	6.5	none				Weir was breeched by high water
5/21/2002	5.5	none				Weir not fished due to high water from 5/21-6/2
6/3/2002	7.5	none				Reinstalled weir
6/4/2002	8.0	none				Downstream trap box was not secure
6/11/2002	10.0	Rbt	338	302	M	Caught while electrofishing plunge pool below culverts
6/11/2002	10.0	Rbt X Wct	404	549	Unk	Caught while electrofishing plunge pool below culverts
6/11/2002	10.0	Rbt	199	71	M	Caught while electrofishing plunge pool below culverts
6/12/2002	9.0	none				Hole in weir-repaired
6/25/2002	13.0	none				Removed weir

Table 4. Survey dates, water temperatures and numbers of trout redds seen on Caboose and Debt creeks, spring 2002.

Date[a]	Stream	Water temp. (°C)	Number of new redds
5/8/2002	Caboose Cr.	3	0
5/15/2002	Caboose Cr.	4.5	0
5/18/2002	Caboose Cr.	5.6	0
6/5/2002	Caboose Cr.	8.5	0
6/14/2002	Caboose Cr.	10	0
6/17/2002	Caboose Cr.	10.3	0
6/19/2002	Caboose Cr.	9	0
5/8/2002	Debt Cr.	4	0
5/13/2002	Debt Cr.	6.5	0
5/18/2002	Debt Cr.	6	0
6/5/2002	Debt Cr.	9.1	0
6/12/2002	Debt Cr.	10.3	1
6/14/2002	Debt Cr.	11.7	0
6/17/2002	Debt Cr.	10.5	1
6/19/2002	Debt Cr.	9.4	0

[a] High, turbid water prevented redd surveys from 5/21 through 6/4

Spawning Channel Feasibility

Following the peak flows in late May on the Moyie River, the elevation difference between the proposed spawning channel inlet and outlet sites decreased (Figure 3). For example, on March 27, 2002, the elevation difference between the inlet and outlet sites was 1 m, while the staff gauge reading was 1.78. The spring runoff flow peaked at 8,650 f^3/s (245 m^3/s) at the USGS gauging station at Eastport, Idaho on May 21, which was about 5,000 f^3/s (142 m^3/s) above median flows and only 1,950 ft^3/s (55 m^3/s) below the maximum discharge ever recorded at that gauging station. These high flows partly eroded a rock dike that separated the proposed spawning channel site from the main river channel. Changes to the river channel as a result of the high flows and relocation of rock from the dike appeared to decrease the difference in elevation between the proposed inlet and outlet sites. On July 16, 2002, the elevation difference between the inlet and outlet was only 0.3 m, though the staff gauge reading of 1.65 was similar to March 27 (Figure 3).

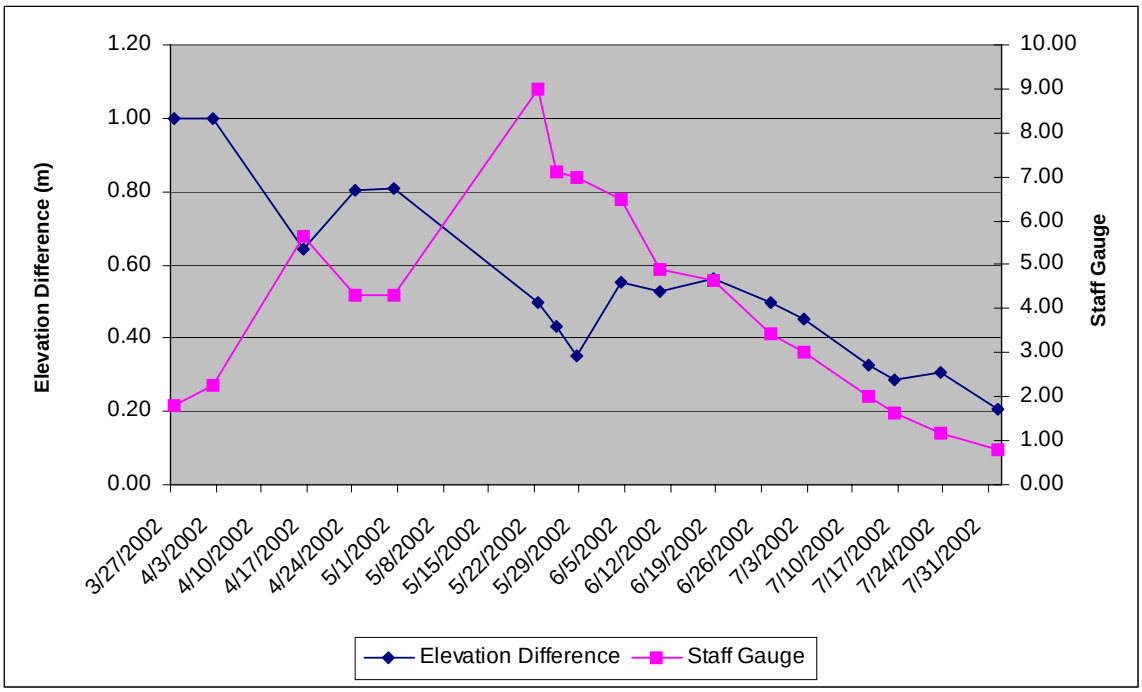

Figure 3. Elevation differences between the proposed spawning channel inlet and outlet sites on the Moyie River, spring and summer 2002.

Recruitment from Boulder Creek and the Moyie River

No age-0 rainbow trout out-migrants were sampled with driftnets in the Moyie River. An estimated 2,107 (95% CI = 1,590-2,623) age-0 rainbow trout out-migrated from Boulder Creek during July and August.

Deep Creek Water Temperatures

Maximum daily water temperatures were ≥24°C on several occasions at all four Deep Creek sites downstream of McArthur Lake, while daily average temperatures exceeded 22°C at three of the four sites (Appendix A, Table 5). Average daily water temperatures remained below 20°C on the two tributaries upstream of McArthur Reservoir (Appendix A).

Table 5. Summary of water temperature data for the four Deep Creek temperature logger sites downstream of McArthur Reservoir.

Site	Number of days avg. temp was ≥22°C	Number of days avg. temp was ≥24°C	Number of days max. temp was ≥24°C	Number of days min. temp was ≥22°C	Maximum temp °C
Downstream of McArthur Dam	11	1	8	2	25.1
Hwy 95 bridge at Naples	2	0	3	0	24.5
Approx. 2.5 km downstream of Naples	1	0	5	0	24.4
Approx. 1.4 km downstream of the Deep Cr. Inn	1	0	11	0	25.2

Rainbow and Bull Trout Spawning Tributary Identification and Migration Timing

Rainbow Trout

Eleven radio-tagged rainbow trout were monitored during the spring 2002 spawning season, including nine tagged in 2002 and two tagged in 2001. One westslope cutthroat trout was also radio-tagged in 2002 and monitored during the spawning season (Appendix B). Seven of the rainbow trout and the single westslope cutthroat trout showed movements during the spawning season (Table 6). Five of these trout were located in tributary streams, including three rainbow and one westslope cutthroat trout in Boulder Creek and a rainbow trout in Caboose Creek (Table 6). The rainbow trout in Caboose Creek was caught at the weir, radio-tagged (radio frequency 31.462), and released 50 m upstream of the culverts on May 13 (Table 3). This fish was located either in the plunge pool below the culverts or in the Kootenai River at the mouth of Caboose Creek on several subsequent dates through June 6, but was never located upstream of the culverts. Radio contact with 31.462 was lost after June 6. One rainbow trout (31.643), tagged near Bonners Ferry at rkm 244.5, was located in Kootenay Lake, British Columbia on July 3, after radio contact had been lost since locating the fish at rkm 272.6 (near Curley Creek) on May 23. An angler harvested this fish from Kootenay Lake at rkm 75 in August 2002. Radio contact was also lost with another rainbow trout (31.624) after it was located in Montana at rkm 282.1 (about 6 km upstream of the Idaho-Montana border) on May 18. Another rainbow trout (31.662) moved upstream from rkm 270.6 to rkm 293 in March and as far as rkm 299.5 (Troy, Montana) by April, but this fish was never documented in a tributary stream.

No obvious relationship was observed between rainbow trout spawning movement and either Kootenai River water temperature or discharge (Table 6, Figure 4). However, three of the four rainbow trout and the single westslope cutthroat trout were first located in tributary streams when the tributary temperatures were near 6°C (Table 6).

Bull Trout

Five bull trout were monitored during the 2002 spawning season (Appendix C). Four of these fish showed movements (Table 6). Two fish were located in tributaries during the spawning season, including the Moyie River, Idaho and O'Brien Creek, Montana (Table 6, Appendix C). One bull trout (30.474) was located twice in the Moyie River, once on July 2 and once on September 16. During the week before and the week after each of these dates, this fish was located in the Kootenai River. The second bull trout (31.033) was located in the Moyie River in June but was in O'Brien Creek from the end of August into October. Bull trout movements in the mainstem Kootenai River appeared to be associated with an increasing hydrograph (Table 6 and Figure 4).

Table 6. Summary of first recorded movements during spawning seasons and first recorded locations in tributary streams for radio-tagged trout, 2002. Bullt = bull trout, Rbt = rainbow trout, Wct = westslope cutthroat trout.

Species	Radio frequency	Tag date	Total length (mm) when tagged	Sex[a]	Date of first recorded movement during spawning season	Kootenai R. water temp during first recorded movement (°C)	Date first located in tributary	Name of tributary	Water temp when first located in tributary (°C)
Bullt	30.160	4/23/02	478	u	8/5/2002[b]	15.9	—	—	—
Bullt	30.191	10/8/99	800	m	7/1/2002	10.4	—	—	—
Bullt	30.474	10/1/99	690	u	6/17/2002[c]	10.3	9/16/2002	Moyie R.	14.6
Bullt	31.033	3/14/01	581	u	7/12/2002[d]	13.5	8/26/2002	O'Brien Cr.	no data
Rbt	31.462	5/13/02	471	m	—	—	5/13/2002[e]	Caboose Cr.	5.8
Rbt	31.602	4/3/02	331	u	4/15/2002	3.5	6/4/2002	Boulder Cr.	5.9
Rbt	31.624	4/3/02	368	u	4/30/2002	7.2	—	—	—
Rbt	31.643	4/8/02	485	u	5/3/2002[f]	6.7	—	—	—
Rbt	31.662	5/1/01	396	u	3/13/2002	2.4	—	—	—
Rbt	31.722	5/2/02	485	f	5/5/2002	4.8	6/4/2002	Boulder Cr.	5.9
Rbt	31.802	5/2/02	506	m	5/14/2002	8.2	5/18/2002	Boulder Cr.	4.2
Wct	31.562	5/2/02	376	u	5/23/2002	4.8	6/4/2002	Boulder Cr.	5.9

[a] u = unknown, m = male, f = female

[b] Moved up from rkm 265.2 to rkm 273.5, but was back down to rkm 265.3 the next week and stayed in that area the rest of the year.

[c] This fish was also located in the Moyie River on July 2, 2002 and moved upstream as far as rkm 277.8 before being located in the Moyie River again on September 16.

[d] This fish was also located in the Moyie River June 17, 18, and 19, 2002.

[e] Caught at weir in Caboose Cr.

[f] Harvested in Kootenay Lake approximately August 15, 2002.

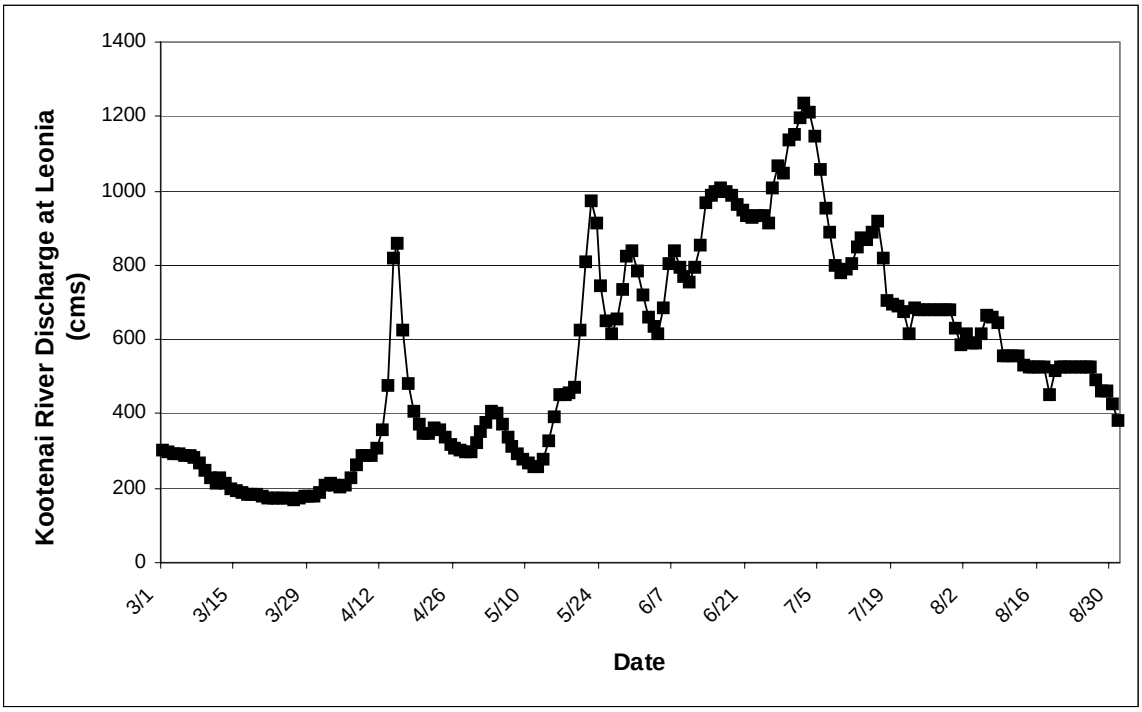

Figure 4. Kootenai River discharge (m^3/s) at Leonia, March 1 through August 31, 2002 (data from U.S. Army Corps of Engineers).

Bull Trout Redd Surveys

Nineteen bull trout redds were found on Kootenai River tributaries in Idaho in 2002 (Table 7). Bull trout were also observed during redd surveys, including two fish in Boulder Creek, four in North Callahan Creek, and 20 in South Callahan Creek. Estimated size (TL) ranges of fish seen were 460–610 mm in North Callahan Creek and 150–680 mm in South Callahan Creek. Both fish seen in Boulder Creek were estimated at 610 mm. One kokanee and one kokanee redd were observed in Boulder Creek, and nine kokanee and one kokanee redd were observed in Curley Creek (Table 7).

Table 7. Streams surveyed for bull trout redds and numbers of bull trout and kokanee redds found, fall 2002.

Stream	Date	Water Temp. (°C)	Transect start point description	Start point UTM coordinates[a]		Transect end point description	End point UTM coordinates[a]		Number of new bull trout redds	Number of new kokanee redds
				Eastings	Northings		Eastings	Northings		
Boulder Cr.	9/5	13	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	0	0
Boulder Cr.	9/6	12	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	0	0
Boulder Cr.	9/12	11	mouth	569849	5386164	50 m upstream of railroad trestle	n. t.	n. t.	0	1
Boulder Cr.	9/17	10	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	0	0
Boulder Cr.	10/2	6.5	mouth	569849	5386164	Waterfalls 1.9 km upstream,	568641	5385028	1	0
Boulder Cr.	10/15	4	mouth	569849	5386164	Waterfalls 1.9 km upstream	568641	5385028	1	0
Curley Cr.	9/12	12	mouth	n. t.	n. t.	Waterfall 237 m upstream	n. t.	n. t.	0	1
Curley Cr.	9/17	11.5	mouth	n. t.	n. t.	Waterfall 237 m upstream	n. t.	n. t.	0	0
Curley Cr.	10/2	8	mouth	n. t.	n. t.	Waterfall 237 m upstream	n. t.	n. t.	0	0
Moyie R.	9/20	14	mouth	n. t.	n. t.	Upstream end of campground	n. t.	n. t.	0	0
N. Callahan Cr.	10/7	n. t.[b]	100 m downstream of Smith Cr.	569501	5365990	Waterfalls barrier	568218	5366538	9	0
N. Callahan Cr.	10/16	4	Frezkat Cr.	568983	5366101	Waterfalls barrier	568218	5366538	4	0
S. Callahan Cr.	9/24	8	bridge on forest rd. 4554	570596	5362719	Camp downstream of Glad Cr.	n. t.	n. t.	2	0
S. Callahan Cr.	9/25	7.5	campsite downstream of Glad Cr.	n. t.	n. t.	0.9 km upstream of forest rd. 414	566519	5361191	0	0
S. Callahan Cr.	10/3	6.5	bridge on forest rd. 4554	570596	5362719	0.9 km upstream of forest rd. 414	566519	5361191	2	0
S. Callahan Cr.	10/17	3.5	650 m downstream of Glad Cr.	n. t.	n. t.	Forest rd. 414 bridge	567347	5360822	0	0

[a] Zone 11; datum = WGS84

[b] n. t. = not taken

Rainbow Trout Population Size Structure

Eighty-three rainbow trout were collected during 3.87 h of fall electrofishing effort. Total catch-per-unit-effort for rainbow trout was 7.0/h for fish ≤200 mm TL, 6.5/h for the 200-305 mm TL group, 7.8/h for the 306-406 mm TL group, and 0.3/h for fish >406 mm TL. The relative weights for the 201-305 mm TL and 306-406 mm TL size groups were 83 (SE = 1; n = 25) and 80 (SE = 1; n = 30), respectively. One rainbow trout >406 mm was sampled during fall electrofishing. This fish was 468 mm with a relative weight of 96. The rainbow trout PSD was 55 ± 15, while the QSD was 2.

DISCUSSION

Rainbow trout adults were successfully trapped at the weir and by electrofishing in Caboose Creek and transported upstream of the railroad culverts. I could not determine if this effort helped increase spawning activity as no redds were observed during spring surveys of Caboose Creek. However, drift net sampling showed that successful spawning did occur in Caboose Creek. Limited visibility due to the dense canopy shading Caboose Creek may have hindered identification of redds.

Transporting rainbow trout adults upstream of the Caboose Creek culverts did not appear to increase age-0 production relative to the reference stream. Age-0 rainbow trout production in Caboose Creek (1,215 summer out-migrants) was similar to that in Debt Creek (1,111 summer out-migrants). The number of out-migrants from both creeks in 2002 was higher than in 2000 when an estimated 868 and 383 age-0 rainbow trout out-migrated from Caboose and Debt creeks, respectively (Walters 2002).

High spring flows in the Moyie River in 2002 caused an apparent change to the river channel, decreasing the elevation difference between the proposed spawning channel inlet and outlet. An evaluation of the spawning channel site prior to the spring 2002 flows determined that the channel would have to be excavated approximately 1 m deep in order to deliver enough water for suitable spawning conditions (M. Maffey, IDFG engineer, personal communication). Suitable spawning conditions would include a minimum depth of 0.18 m and velocity of 0.19 to 0.48 m/s (IDFG unpublished data; H. Manson, B. C. Hydro, personal communication). Because the elevation difference between the inlet and outlet is now <1 m, the spawning channel could not be excavated and still provide suitable spawning flows. The possibility of placing a rock weir at the channel inlet to increase the head was also considered. This manipulation to the main river channel would likely divert some of the river's energy to the shore opposite the spawning channel, causing the river to further degrade there and resulting in even less water available to the spawning channel site (M. Maffey, IDFG engineer, personal communication).

Water temperatures in most reaches of Deep Creek exceeded optimal levels for rainbow trout and may be a limiting factor to the population downstream of McArthur Lake. These high temperatures (≥22°C) may explain why juvenile densities are low in Deep Creek relative to several Deep Creek tributaries (Paragamian 1995a; Fredericks and Hendricks 1997; Downs 1999). Carlander (1969) reported an optimum temperature for rainbow trout as below 21°C, while Becker (1983) reported that rainbow trout tended to concentrate where temperatures were between 15.6 and 21.1°C. Laboratory experiments indicate that trout reduce and finally cease

feeding as water temperatures rise to between 22 and 25°C (Dickson and Kramer 1971), while young Kamloops rainbow trout acclimated at 11°C died at 24°C (Black 1953).

Both tributaries that flow into McArthur Lake, Deep Creek and Dodge Creek, remained below 20°C throughout the summer. However, base flows in Deep Creek upstream of McArthur Lake were minimal (estimated <0.01 m^3/s), so this section probably provides little rainbow trout rearing habitat. Planned sampling of temperature and dissolved oxygen profiles in McArthur Lake had to be cancelled because the lake was drained in 2002.

A total of seven radio-tagged rainbow trout have been located in Boulder Creek during the spring spawning season from 1999-2002, while a maximum of two radio-tagged rainbow trout were located in other Kootenai River tributaries during the same period (Walters and Downs 2001, Walters 2002, 2003). This suggests that Boulder Creek supports the highest number of rainbow trout spawners in the Kootenai River, Idaho upstream of Bonners Ferry.

Boulder Creek also produced the highest number of age-0 rainbow trout out-migrants of the streams sampled with drift nets in 2002, supporting previous findings that this stream is the largest source of rainbow trout recruits to the Kootenai River, Idaho upstream of Bonners Ferry (Downs 2000; Walters 2002, 2003). The survival rate of the age-0 out-migrants upon reaching the Kootenai River is unknown. August snorkel surveys show at least three age-classes of rainbow trout rearing in Boulder Creek, suggesting that some juveniles could out-migrate at age-1 or older (Fredericks and Hendricks 1997; Downs 1999; Walters 2002, 2003). Determining out-migrant survival rates and sources of juvenile mortality could aid management efforts to increase rainbow trout recruitment. Determining which age-class of out-migrants ultimately contributes the most recruits to the adult population could also aid management efforts to increase adult densities.

Tributary stream water temperature seemed to be an important factor guiding when rainbow trout entered tributaries to spawn. Four of five rainbow and westslope cutthroat trout documented in tributaries during this study were first located when the water temperature was 6°C. Hartman (1969) reported that Gerrard stock rainbow trout from Kootenay Lake move onto spawning areas in the Lardeau River when temperatures reach about 5°C. He reported these conditions might not be causal but merely associated with other environmental conditions that affect the fish. In Ontario, rainbow trout movement into a spawning tributary of Lake Huron was triggered by winter freshets and rises in water temperature in the tributary (Dodge and MacCrimmon 1971).

The rainbow trout that was radio-tagged in the Kootenai River and eventually located in Kootenay Lake, British Columbia supports anecdotal evidence of adfluvial fish from Kootenay Lake spawning in tributaries upstream of Bonners Ferry. In addition, 15 rainbow trout >406 mm TL were sampled during spring electrofishing for 2000, 2001, and 2002 combined, but only three fish this size were sampled during fall 1999, 2000, and 2001 combined (IDFG, unpublished data). These data also suggest that larger fish are migrating upstream from Kootenay Lake in the spring to spawn in the Kootenai River watershed in Idaho and Montana. Therefore, an unknown proportion of juvenile rainbow trout out-migrants from tributary streams likely rear in Kootenay Lake and not in the Kootenai River.

This study is the first to document bull trout redds in the Callahan Creek drainage in Idaho. The size of many of the bull trout seen during redd surveys suggests they are likely fluvial fish from the Kootenai River or adfluvial fish from Kootenay Lake. Regardless, North and South Callahan creeks are the only streams with significant bull trout reproduction in the

Kootenai River drainage in Idaho (Walters and Downs 2001; Walters 2002, 2003). Therefore, bull trout redd count index reaches should be established on North and South Callahan creeks for annual monitoring of the spawning population. This should include more extensive bull trout redd surveys of North Callahan Creek to determine if spawning occurs outside of the reach surveyed in 2002. Little else is known about the bull trout population in the Callahan drainage. Additional research on this population such as out-migration rates and rearing densities could help with conservation management and help determine if this population meets draft bull trout recovery plan criteria.

I documented an increase in rainbow trout PSD since implementation of more restrictive trout regulations on the Kootenai River. The 2002 rainbow trout PSD (54) was higher than in 2001 and 2000 when the PSD's were 24 and 39, respectively (Walters 2002; Walters 2003). The 2002 QSD (2) was slightly higher than in 2001 when the QSD was zero but the same as in 2000 (Walters 2002; Walters 2003). The 2002 PSD was near the upper end of the 1-63 PSD range, while the 2002 QSD was near the lower end of the 0-42 QSD range reported for wild trout fisheries in Idaho (Schill 1991). Rainbow trout PSD estimates for the Kootenai River should be considered in the context of the low-density population. For example, PSD estimates are lower for the rainbow trout population in the Flower-Pipe section of the Kootenai River, Montana (Montana Department of Fish, Wildlife and Parks, unpublished data). This appears to be a result of a higher proportion of juveniles (≤200 mm) in Montana, suggesting better recruitment, while densities of fish >200 mm are up to an order of magnitude higher than in Idaho.

RECOMMENDATIONS

1. Due to the problems identified with the proposed Moyie River spawning channel site, I recommend abandoning this project and looking at alternate options of increasing rainbow trout recruitment.

2. Determine if there are options to decrease summer water temperatures in Deep Creek.

3. Management of the Callahan Creek watershed should give bull trout a high priority along with the native redband rainbow trout population (Allendorf et al. 1980; Knudsen et al. 2002).

4. Repeat bull trout redd surveys in the Callahan drainage and establish index transects that could be completed annually.

5. Continue monitoring the Kootenai River rainbow trout population annually to measure the effects of the new bag and size limits.

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LITERATURE CITED

Allendorf, F. W., D. M. Espeland, D. T. Scow, and S. Phelps. 1980. Coexistence of native and introduced rainbow trout in the Kootenai River drainage. Proceedings of the Montana Academy of Sciences 39:28-36.

Anderson, R. O. 1976. Management of small warm water impoundments. Fisheries 1(6):5-7, 26-28.

Anderson, R. O., and R. M. Neuman. 1996. Length, weight, and associated structural indices. Pages 447-482 *in* B. R. Murphy and D. W. Willis, editors. Fisheries Techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Becker, G. C. 1983. Fishes of Wisconsin. The University of Wisconsin Press, Madison, Wisconsin. 1,052 pp.

Black, E. C. 1953. Upper lethal temperatures of some British Columbia freshwater fishes. Journal of the Fisheries Research Board of Canada 10(4):196-210.

Carlander, K. D. 1969. Handbook of freshwater fishery biology. Volume 1. Iowa State University Press, Ames, Iowa. 752 pp.

Chapman, D. W., and B. May. 1986. Downstream movement of rainbow trout past Kootenai Falls, Montana. North American Journal of Fisheries Management 6:47-51.

Dickson, I. W., and R. H. Kramer. 1971. Factors influencing scope for activity and active and standard metabolism of rainbow trout *Salmo gairdneri*. Journal of the Fisheries Research Board of Canada 28:587-596.

Dodge, D. P., and H. R. MacCrimmon. 1971. Environmental influences on extended spawning of rainbow trout *Salmo gairdneri*. Transactions of the American Fisheries Society 100:312-318.

Downs, C. C. 1999. Kootenai River fisheries investigations: Rainbow trout recruitment. 1997 Annual report to Bonneville Power Administration. Project 88-65. Idaho Department of Fish and Game, Boise, Idaho.

Downs, C. C. 2000. Kootenai River fisheries investigations: Rainbow trout recruitment. 1998 Annual report to Bonneville Power Administration. Project 88-65. Idaho Department of Fish and Game, Boise, Idaho.

Dunham, J., B. Rieman, and K. Davis. 2001. Sources and magnitude of sampling error in redd counts for bull trout. North American Journal of Fisheries Management 21:343-352.

Fredericks, J., and S. Hendricks. 1997. Kootenai River fisheries investigations: Rainbow trout recruitment investigations. 1996 Annual report to Bonneville Power Administration, Project 88-65. Idaho Department of Fish and Game. Boise, Idaho.

Grost, R. T., W. A. Hubert, and T. A. Wesche. 1991. Description of brown trout redds in a mountain stream. Transactions of the American Fisheries Society 120:582-588.

Gustafson, K. A. 1988. Approximating confidence intervals for indices of fish population size structure. North American Journal of Fisheries Management 8:139-141.

Hartman, G. F. 1969. Reproductive biology of the Gerrard stock rainbow trout. Pages 53-67 *in* T. G. Northcote, ed., Symposium on Trout and Salmon in Streams. Institute of Fisheries, the University of British Columbia, Vancouver, British Columbia.

Knudsen, K. L., C. C. Muhlfeld, G. K. Sage, and R. F. Leary. 2002. Genetic structure of Columbia River redband trout populations in the Kootenai River drainage, Montana, revealed by microsatellite and allozyme loci. Transactions of the American Fisheries Society 131:1093-1105.

May, B., and J. Huston. 1979. Kootenai River fisheries investigations, final job report, contract no. DACW 67-76-C-0055. Montana Department of Fish and Game. 57 pp.

Muth, R. T., and J. C. Schmulbach. 1984. Downstream transport of fish larvae in a shallow prairie river. Transactions of the American Fisheries Society 113:224-230.

Paragamian, V. L. 1995a. Kootenai River fisheries investigation: Stock status of burbot and rainbow trout and fisheries inventory. Idaho Department of Fish and Game, 1994 Annual Report to Bonneville Power Administration, Project 88-65. Boise, Idaho.

Paragamian, V. L. 1995b. Kootenai River fisheries investigations: Stock status of burbot and rainbow trout and fisheries inventory. Idaho Department of Fish and Game, 1995 Annual Report to Bonneville Power Administration, Project 88-65. Boise, Idaho.

Paragamian, V. L. 2000. The effects of variable flows on burbot spawning migrations in the Kootenai River, Idaho, USA, and Kootenay Lake, British Columbia, Canada, after construction of the Libby Dam. Pages 111-123 *in* V. L. Paragamian and D. W. Willis, editors, Burbot biology, ecology, and management. American Fisheries Society, Fisheries Management Section, Publication Number 1, Bethesda, Maryland.

Paragamian, V. L., and G. Kruse. 2001. Kootenai River white sturgeon spawning migration behavior and a predictive model. North American Journal of Fisheries Management 21:10-21.

Partridge, F. 1983. Kootenai River fisheries investigations. Idaho Department of Fish and Game. Job Completion Report, Project F-73-R-5. Boise, Idaho.

Richards, D. 1997. Kootenai River biological baseline status report. Kootenai Tribe of Idaho report to Bonneville Power Administration, Project 94-49. Bonners Ferry, Idaho.

Schill, D. J. 1991. Wild trout investigations. Idaho Department of Fish and Game. Job Performance Report. Project F-73-R-13, Job 1. Boise, Idaho.

Shepard, B. B., and P. J. Graham. 1983. Fish resource monitoring program for the upper flathead basin. Flathead River Basin Environmental Study, EPA Contract No. R008224-01-4.

Simpkins, D. G., and W. A. Hubert. 1996. Proposed revision of the standard-weight equation for rainbow trout. Journal of Freshwater Ecology 11:319-325.

U.S. Fish and Wildlife Service. 2002. Chapter 4, Kootenai River Recovery Unit. 89 p. *In*: U.S. Fish and Wildlife Service. Bull trout *Salvelinus confluentus* draft recovery plan. Portland, Oregon.

Walters, J. P. 2002. Kootenai River fisheries investigations: rainbow and bull trout recruitment. Annual progress report to Bonneville Power Administration, April 1, 2000-March 31, 2001. Project 1988-06500. Idaho Department of Fish and Game. Boise, Idaho.

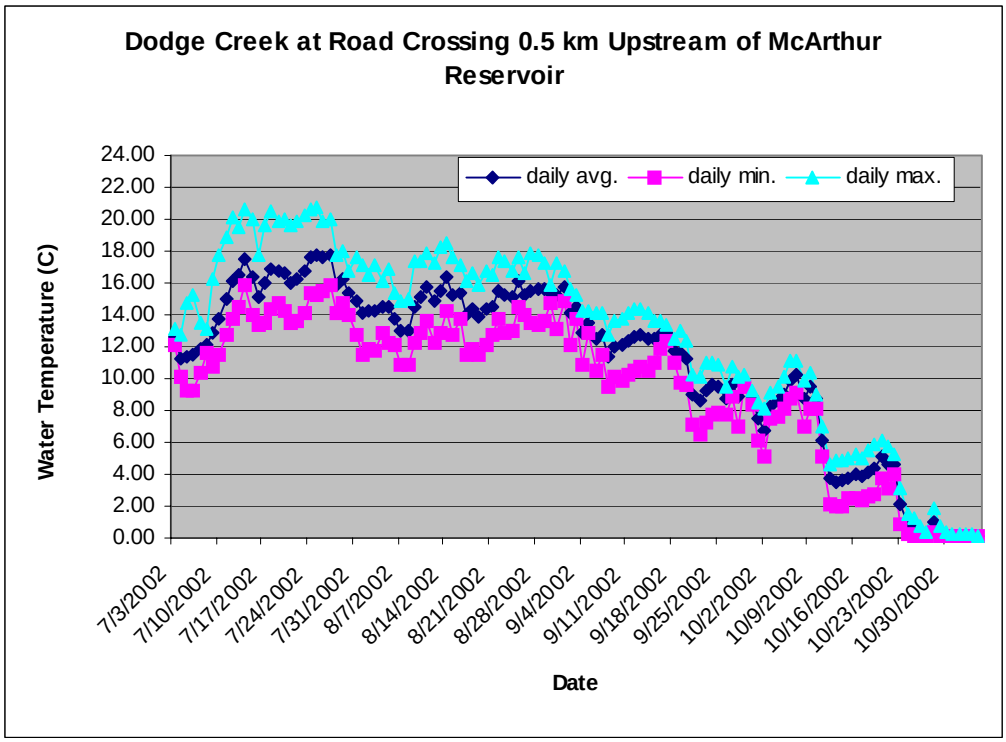
Walters, J. P. 2003. Kootenai River fisheries investigations: rainbow and bull trout recruitment. Annual progress report to Bonneville Power Administration, April 1, 2001-March 31, 2002. Project 1988-06500. Idaho Department of Fish and Game. Boise, Idaho.

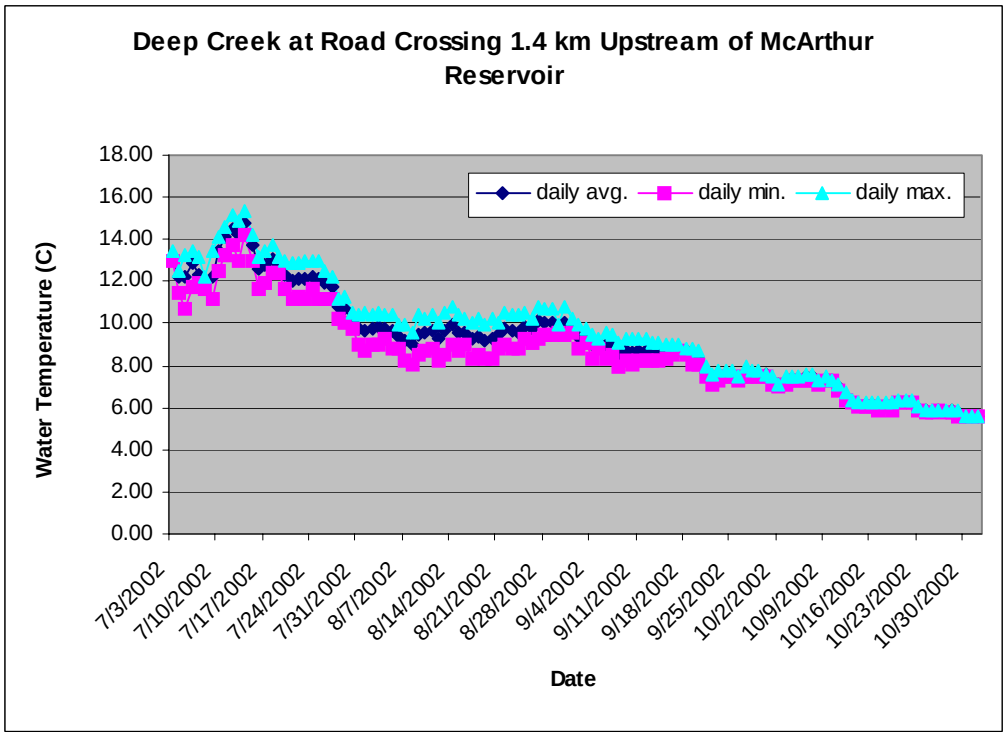
Walters, J. P., and C. C. Downs. 2001. Kootenai River fisheries investigations: rainbow and bull trout recruitment. 1999 Annual report to Bonneville Power Administration. Project 1988-06500. Idaho Department of Fish and Game. Boise, Idaho.

Wege, G. J., and R. O. Anderson. 1978. Relative weight (W_r): a new index of condition for largemouth bass. Pages 79-91 *in* G. D. Novinger and J. G. Dillard, editors. New approaches to the management of small impoundments. American Fisheries Society, North Central Division, Special Publication 5. Bethesda, Maryland.

APPENDICES

Appendix A. Daily water temperatures at six sites in the Deep Creek drainage, Idaho, summer and fall 2002.





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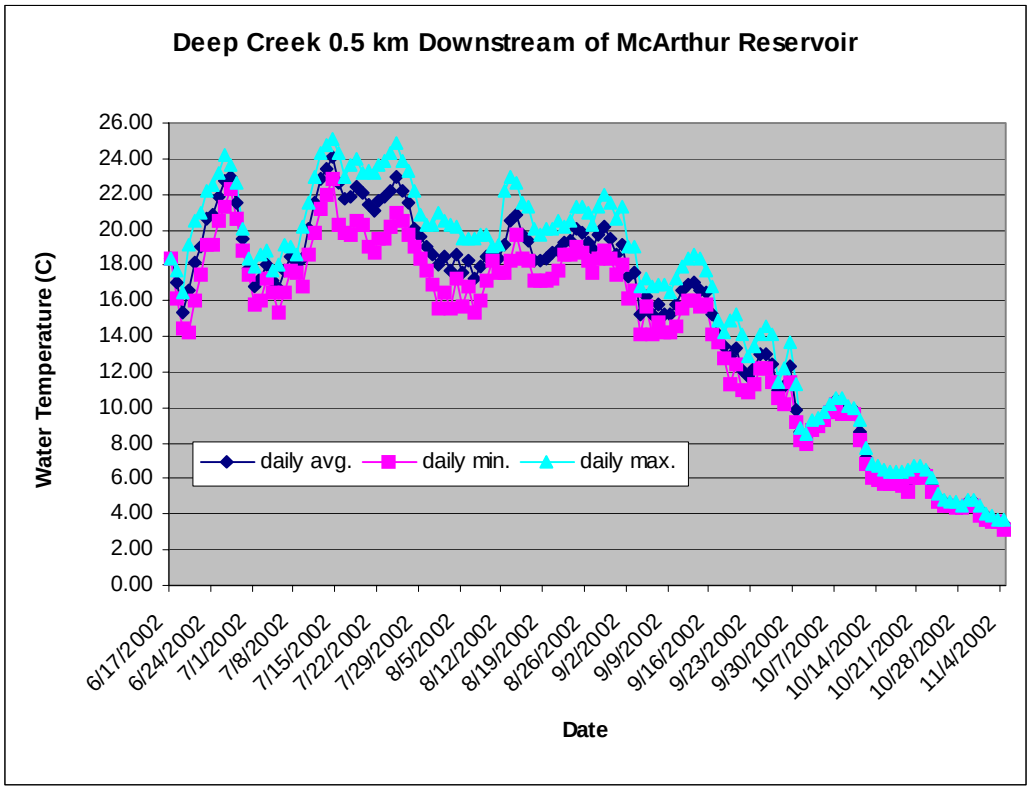

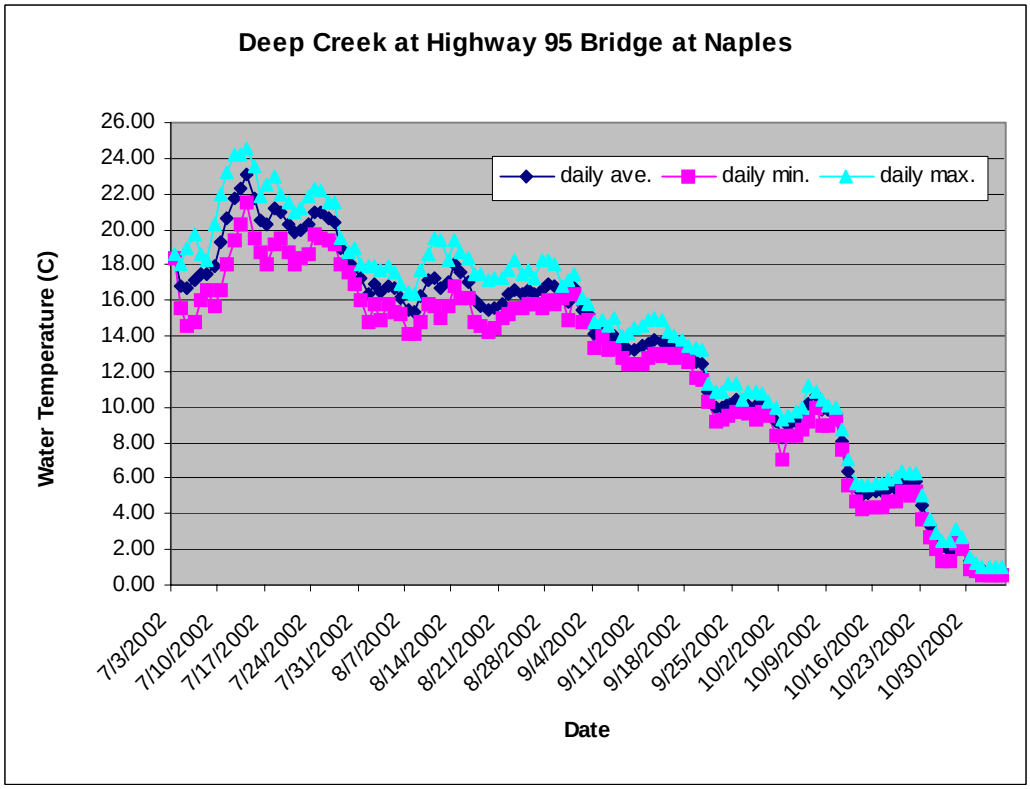

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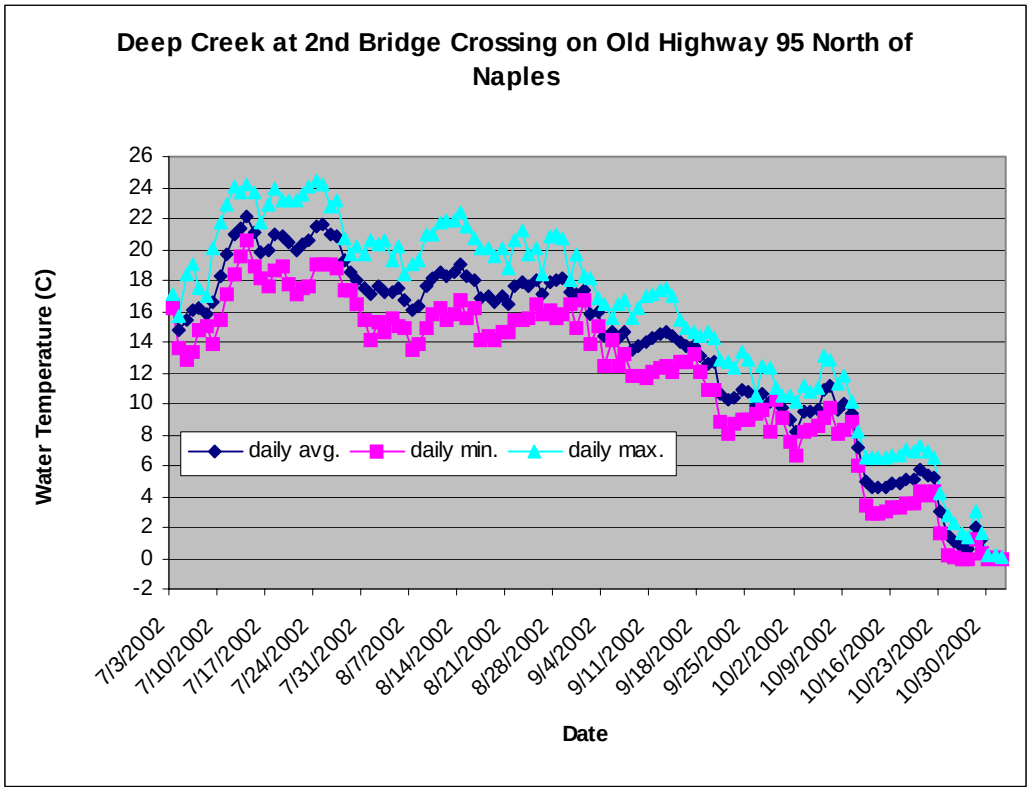

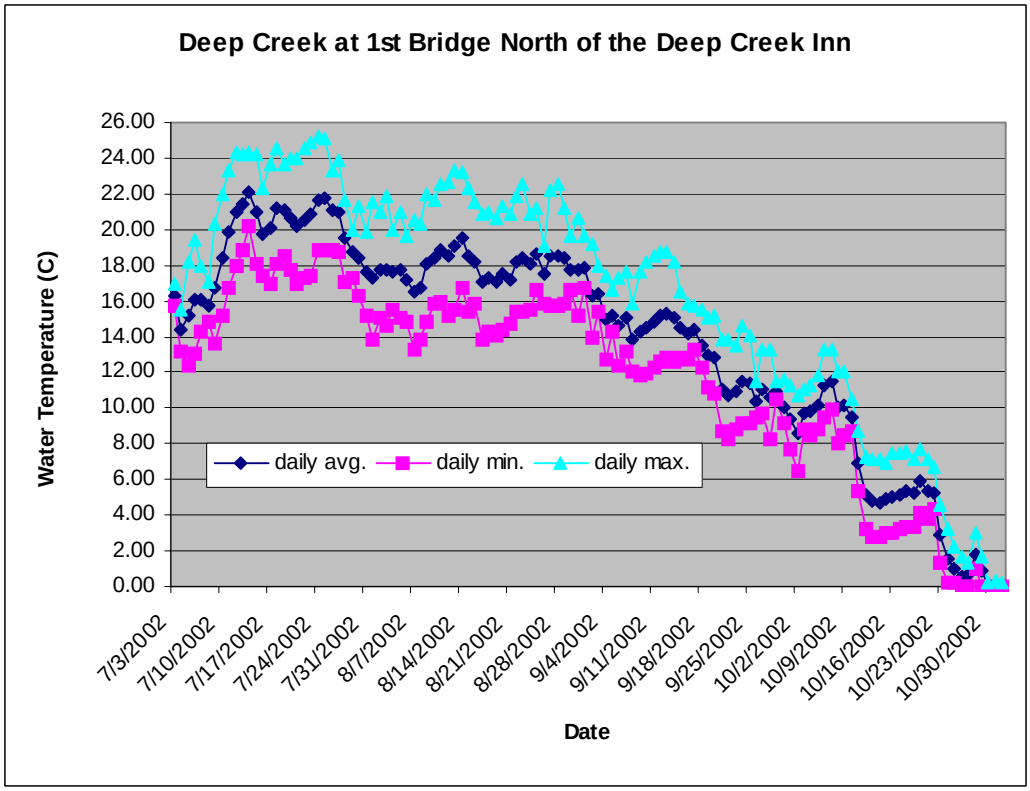

Appendix B. Telemetry locations for radio-tagged rainbow trout with active transmitters in 2002.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
30.120	560	m	F	3/2/2003	4/12/2001	268.5	Caught between Caboose and Debt Creek-released at Debt Cr; got water in incision during surgery; dissolvable sutures used; hooked jaw, looked like testes seen through incision
30.120					4/13/2001	267.1	Boat
30.120					4/16/2001	268.2	Boat
30.120					4/23/2001	269.6	Boat
30.120					5/2/2001		Not located 150-285 or Deep Cr.
30.120					5/9/2001		Aerial-not downriver 285-113
30.120					5/18/2001	299.5	Aerial-@Callahan Cr.
30.120					5/23/2001	299.5	Aerial-up Callahan
30.120					5/30/2001	299.5	Aerial-up Callahan @ Hwy
30.120					6/11/2001		No loc from 214-305
30.120					7/11/2001		No loc from 245-310
30.120					7/25/2001		No loc from 245-310
30.120					8/1/2001		No loc from 245-315
30.120					8/8/2001		No loc from 245-310
30.120					8/16/2001		No loc from 245-310
30.120					8/22/2001		No loc 207-310
30.120					8/29/2001		No loc 245-310
30.120					9/7/2001		No loc 245-310
30.120					9/24/2001		No loc 245-310
30.120					10/3/2001		No loc 245-305
30.120					10/10/2001		No loc 245-305
30.120					10/17/2001		No loc 245-310
30.120					10/24/2001		No loc 245-305
30.120					11/5/2001		No loc 245-305
30.120					12/27/2001		No loc 121-303.5
30.120					4/10/2002		No loc 200 to 304
30.120					4/15/2002		No loc 113-304
30.120					5/7/2002		No loc 245-305
30.120					6/4/2002		No loc 245-310
30.120					6/24/2002		No loc by air 271-310
30.120					7/11/2002	192.0	At Jerome slough
30.120					7/15/2002	192.0	At Jerome slough
30.120					8/5/2002	193.5	Moved upstream
30.120					8/16/2002	193.5	Same
30.120					10/2/2002	192.2	Bend above Jerome slough
30.120					10/15/2002	192.2	Bend above Jerome slough
30.120					12/3/2002	192.2	Bend above Jerome slough
30.120					12/14/2002	192.2	Bend above Jerome slough
31.253	421	f	H	3/1/2002	3/21/2001	265.0	Capt/rel @ Hemlock
31.253					3/23/2001	260.4	Boat
31.253					3/27/2001	260.0	Boat
31.253					4/2/2001	259.5	Boat
31.253					4/9/2001	258.6	Boat
31.253					4/16/2001		Boat-not located from Crossport to Boulder Creek
31.253					4/22/2001	258.6	Up Moyie River beneath highway bridge
31.253					5/2/2001	257.3	
31.253					5/6/2001	256.3	Boat
31.253					5/18/2001	256.3	Aerial-above bend
31.253					5/21/2001	256.3	Boat
31.253					5/23/2001	256.3	
31.253					5/26/2001	256.3	Boat
31.253					5/30/2001	256.3	Above bend upstream Crossport
31.253					6/11/2001	256.0	Down 0.3 rkm
31.253					6/21/2001		OFF until 9/21/01
31.253					7/5/2001		No loc
31.253					9/24/2001	257.5	Bend above Crossport
31.253					10/3/2001	256.0	@ Bend, down a bit
31.253					10/10/2001	256.0	Bend above Crossport
31.253					10/17/2001	257.5	Upstream

Appendix B. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.253					10/24/2001	257.3	Upstream
31.253					11/5/2001	257.3	Same
31.253					12/12/2001	257.3	Bend above Crossport
31.253					12/27/2001	256.3	
31.253					2/13/2002	256.3	
31.272	366	U	H	3/1/2002	3/21/2001	265.0	Capt/rel @ Hemlock; used staples to close incision
31.272					3/23/2001	265.4	Boat loc
31.272					3/27/2001	264.9	Boat loc
31.272					4/2/2001		
31.272					4/9/2001	264.8	Boat loc
31.272					4/18/2001	264.8	
31.272					4/23/2001	274.2	Boat loc
31.272					5/2/2001		Not located
31.272					5/9/2001		Aerial-not downriver 245-113
31.272					5/18/2001	285.5	
31.272					5/23/2001	285.2	Aerial
31.272					5/30/2001	285.6	Star Cr. Confluence in KR
31.272					6/11/2001	265.0	Hemlock reach
31.272					6/21/2001		OFF until 9/21/01
31.272					9/24/2001	264.1	Hemlock reach, quiet
31.272					10/3/2001	263.5	On 9/21/01
31.272					10/10/2001	263.5	Hemlock reach
31.272					10/17/2001	263.5	Hemlock reach
31.272					10/24/2001	264.0	Upstream
31.272					11/5/2001	264.0	Same
31.272					12/12/2001	264.0	Hemlock reach
31.272					12/27/2001	264.1	
31.272					2/13/2002	264.1	
31.272					3/13/2002	264.1	
31.462	471	M	A	4/18/2003	5/13/2002	270.7	Caught in weir trap heading upstream in Caboose Cr., released 50 m above Caboose Cr. culverts
31.462					5/16/2002	270.7	In plunge pool below the culverts in Caboose Cr.
31.462					5/18/2002	270.7	In plunge pool below the culverts in Caboose Cr.
31.462					5/23/2002	270.7	D. W. recorded that the fish was in the Kootenai R. (located by plane)
31.462					5/27/2002	270.7	Unknown if fish was in Caboose Creek, probably just picked up the signal from the Kootenai R while going by in boat
31.462					5/29/2002	270.7	D. W. recorded that the fish was at the "confluence" (located by plane), implying the fish was in the river.
31.462					5/30/2002	270.7	Unknown if fish was in Caboose Creek, probably just picked up the signal from the Kootenai R while going by in boat
31.462					5/31/2002	270.7	In plunge pool below the culverts in Caboose Cr.
31.462					6/3/2002	270.7	Up Caboose Cr., below culverts
31.462					6/4/2002	270.7	D. W. just gives the rkm, implying she thought the fish was in the river (?)
31.462					6/5/2002	270.7	Unknown if fish was in Caboose Creek, probably just picked up the signal from the Kootenai R while going by in boat
31.462					6/6/2002	270.7	Unknown if fish was in Caboose Creek, probably just picked up the signal from the Kootenai R while going by in boat
31.462					6/10/2002		No loc by air 245-310
31.462					6/11/2002		No loc by boat 245-276, 199.5-163
31.462					6/12/2002		No loc by boat 177-122
31.462					6/12/2002		No loc by boat 245-275.3
31.462					6/15/2002	224.5	Fixed loc at Flemming Cr.
31.462					6/17/2002		No loc by plane 226-310
31.462					6/18/2002		No loc by boat 258.6-280
31.462					6/19/2002		No loc by boat 258.7-276
31.462					6/20/2002		No loc by boat 199.5-170, 258.5-276
31.462					6/20/2002		No loc by air 302-192

Appendix B. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.462					6/21/2002		No loc by boat 244.6-283.4
31.462					7/11/2002		No loc by boat 170-245
31.462					7/12/2002		No loc by boat 246-276
31.462					12/3/2002		Dead or gone
31.482	356	unk	A	3/29/2003	4/23/2002	262.4	Tagged on night of 4/23, was going to release next morning but it escaped from holding pen
31.482					4/30/2002		Not found by boat 253-276
31.482					5/3/2002	264.0	Upstream
31.482					5/5/2002	264.0	By boat
31.482					5/6/2002	263.8	By boat
31.482					5/9/2002	264.0	By boat
31.482					5/13/2002	263.0	By boat, moved down
31.482					5/14/2002	263.0	By boat
31.482					5/16/2002	263.0	By boat
31.482					5/18/2002	263.0	By boat
31.482					5/23/2002	263.6	By plane
31.482					5/27/2002	263.6	By boat
31.482					5/29/2002	263.6	By air
31.482					5/30/2002	263.6	By boat
31.482					5/31/2002	263.6	By boat
31.482					6/3/2002	264.0	By boat
31.482					6/4/2002	264.0	By air
31.482					6/5/2002	264.0	By boat
31.482					6/6/2002	264.0	By boat
31.482					6/10/2002	264.0	By air
31.482					6/12/2002	264.0	50 m US powerline
31.482					6/17/2002	264.0	50 m US powerline
31.482					6/18/2002	264.0	50 m US powerline
31.482					6/19/2002	264.0	50 m US powerline
31.482					6/20/2002	264.0	50 m US powerline
31.482					6/24/2002	264.0	50 m US powerline
31.482					6/27/2002	264.0	50 m US powerline
31.482					7/1/2002	263.9	Near powerline
31.482					7/6/2002	264.2	By boat
31.482					7/10/2002	263.9	By boat
31.482					7/15/2002	264.1	Below Katka
31.482					7/22/2002		No loc 199-310, tag off 7/22/02
31.482					10/21/2002	264.1	Below Katka
31.482					11/4/2002	264.1	Below Katka
31.482					12/3/2002	264.1	Below Katka
31.502	349	u	A	4/11/2002	5/1/2001	272.2	Tagged and released at Curley Cr.; took 45 min to recover from surgery.
31.502					5/2/2001	272.1	Boat loc
31.502					5/18/2001	271.5	Aerial-below Curley
31.502					5/21/2001	271.5	Boat loc
31.502					5/23/2001	272.0	Aerial
31.502					5/26/2001	271.6	Boat loc
31.502					5/30/2001	271.6	Below Curley
31.502					6/11/2001	271.6	Below Curley
31.502					6/20/2001	271.6	Below Curley
31.502					6/26/2001	271.5	Boat loc
31.502					7/5/2001	271.6	Below Curley
31.502					7/11/2001	270.7	Below Curley
31.502					7/25/2001	271.0	Below Curley
31.502					8/1/2001		OFF until 11/01/01
31.502					10/3/2001		OFF until 11/01/01
31.502					11/5/2001	271.5	On
31.502					12/12/2001	271.5	
31.502					12/27/2001	271.5	
31.502					2/14/2002	271.5	
31.502					3/13/2002	271.5	
31.502					4/10/2002	271.6	Air loc
31.502					4/15/2002	271.6	Below Curley Cr.
31.502					4/23/2002	271.5	Below Curley Cr.
31.502					4/30/2002	271.6	By boat

Appendix B. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.502					5/3/2002	271.5	By air, below Curley Cr.
31.502					5/3/2002	271.6	No loc by boat (tag may be expired)
31.502					5/5/2002	271.5	Tag due to expire
31.502					5/9/2002	271.5	By boat, downstream Curley Cr.
31.502					5/13/2002	271.5	By boat, downstream Curley Cr.
31.502					5/14/2002	271.5	By boat, downstream Curley Cr.
31.502					5/16/2002	271.5	By boat, downstream Curley Cr.
31.502					5/18/2002	271.5	By boat
31.502					5/23/2002	271.5	By plane
31.502					5/27/2002	271.3	By boat
31.502					5/29/2002	271.3	By air
31.502					5/30/2002	271.5	By boat
31.502					5/31/2002	271.5	By boat
31.502					6/3/2002	271.5	By boat
31.502					6/4/2002	271.5	By air
31.502					6/5/2002	271.5	By boat
31.502					6/6/2002	271.5	By boat
31.502					6/10/2002	271.5	By air
31.502					6/12/2002	271.5	By boat
31.502					6/18/2002	271.5	By boat
31.502					6/19/2002	271.5	By boat
31.502					6/20/2002	271.5	By air
31.502					6/24/2002	271.0	By air
31.502					6/25/2002	271.3	By boat
31.502					6/27/2002	271.3	By boat
31.502					7/1/2002	271.3	Below Curley Cr.
31.502					7/6/2002	270.6	By boat
31.502					7/10/2002	270.6	Near Caboose Cr.
31.502					7/22/2002		No loc 199-310, tag expires 4/12/02
31.562	376	u	A	4/7/2003	5/2/2002	266.6	Released 5/3/02
31.562					5/5/2002	266.6	By boat
31.562					5/6/2002	266.6	By boat
31.562					5/9/2002	266.6	By boat
31.562					5/13/2002	266.6	By boat
31.562					5/14/2002	266.6	By air
31.562					5/16/2002	266.6	By boat
31.562					5/18/2002	266.5	At tiny sand island-release point
31.562					5/23/2002	275.4	By plane, moved up during high flows
31.562					5/27/2002	275.4	By boat
31.562					5/30/2002		By boat, not found 244.5 to 276, nor up Boulder Cr. ~100 m above RR trestle
31.562					5/31/2002		By boat, not found 258.7 to 285.5
31.562					6/3/2002		By boat, not found 258.7 to 275
31.562					6/4/2002	275.3	By air up Boulder Cr. ½ to ¾ miles
31.562					6/5/2002	275.3	Up Boulder Cr. ½ to ¾ miles
31.562					6/6/2002	275.3	By boat, up Boulder ½ to ¾ miles
31.562					6/10/2002	275.3	By air, up Boulder ½ to ¾ miles
31.562					6/11/2002		No loc by boat 245-276, 199.5-163
31.562					6/12/2002		No loc by boat 177-122
31.562					6/12/2002		No loc by boat 245-275.3
31.562					6/17/2002	275.3	Up Boulder 1/3-1/2 mi.
31.562					6/18/2002		Not found by boat 258.6-280
31.562					6/19/2002		No loc by boat 258.7-276
31.562					6/20/2002	275.3	Up Boulder 1/3-1/2 mi.
31.562					6/21/2002		No loc by boat 244.6-283.4
31.562					6/23/2002	275.3	Up Boulder
31.562					6/24/2002	275.3	Up Boulder ~1/2 mi.
31.562					6/25/2002		Not heard by boat 258-275.5
31.562					6/27/2002		No loc by boat 258.5-276
31.562					7/1/2002	275.3	Up Boulder ~1/2 mi.
31.562					7/6/2002		No found 258.7-275
31.562					7/10/2002		Not found 244.7-276
31.562					7/11/2002		Not found 170-245
31.562					7/12/2002		Not found 246-276
31.562					7/15/2002	275.3	Up Boulder ~1/3 mi.

Appendix B. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.562					7/22/2002	275.3	Up Boulder ~1/3 mi., tag off 7/31/02
31.562					7/29/2002	275.3	Up Boulder ~1/3 mi., @ bend below the "mine camps"
31.583	358	unk	A	3/17/2003	4/11/2002	268.6	Tagged on 4/11/02. Released at Debt Cr. on 4/12/02
31.583					4/30/2002	270.0	By boat
31.583					5/3/2002	268.2	By boat
31.583					5/5/2002	270.3	By boat, DS of Caboose Cr. ~300 m
31.583					5/6/2002	270.3	By boat, DS of Caboose Cr. ~300 m
31.583					5/9/2002	270.4	By boat, DS of Caboose Cr. ~300 m
31.583					5/13/2002	270.3	By boat, DS of Caboose Cr. ~300 m
31.583					5/14/2002	270.3	By boat, DS of Caboose Cr. ~300 m
31.583					5/16/2002	270.3	By boat
31.583					5/18/2002	270.4	By boat
31.583					5/21/2002	268.4	By boat
31.583					5/23/2002	270.4	By plane, moved up slightly
31.583					5/27/2002	270.4	By boat
31.583					5/29/2002	270.4	By air
31.583					5/30/2002	270.2	By boat
31.583					5/31/2002	270.0	By boat
31.583					6/3/2002	270.0	By boat
31.583					6/4/2002	270.0	By air
31.583					6/5/2002	270.0	By boat
31.583					6/6/2002	270.0	By boat
31.583					6/10/2002	270.0	By air
31.583					6/12/2002	270.3	300 m DS of Caboose
31.583					6/18/2002	270.3	300 m DS of Caboose
31.583					6/19/2002	270.2	By boat
31.583					6/20/2002	269.8	Down slightly
31.583					6/21/2002	269.8	Lost the signal
31.583					6/24/2002	269.8	
31.583					6/27/2002	269.8	By boat
31.583					7/1/2002	269.8	By air, dwnstrm of Caboose
31.583					7/6/2002	269.8	DS Caboose
31.583					7/22/2002		No loc 199-310, tag off 7/10/02
31.583					10/7/2002	268.8	DS Caboose
31.583					10/15/2002	269.8	DS Caboose
31.583					10/21/2002	269.8	DS Caboose
31.583					11/4/2002	269.8	DS Caboose
31.583					12/5/2002	269.8	DS Caboose
31.602	331	unk	A	3/9/2003	4/3/2002	258.7	Tagged on 4/3/02. Released at Moyie R. on 4/4. Might have a stronger signal at 31.602. Off 7/15. On 10/16
31.602					4/8/2002	258.5	Approx. 50m DS of Moyie R.
31.602					4/10/2002	258.0	By air
31.602					4/12/2002	258.6	Between mouth of Moyie and boat launch.
31.602					4/15/2002	265.0	Katka
31.602					4/23/2002	283.6	
31.602					5/3/2002	295.5	By air, middle of troy air strip
31.602					5/14/2002	299.0	Up 0.9 rkm
31.602					5/23/2002	299.0	By plane
31.602					6/4/2002	275.3	By air up Boulder Cr. ~1/4 mi. (second bend)
31.602					6/5/2002	275.3	Up Boulder Cr. ~1/4 mi. (second bend)
31.602					6/6/2002	275.3	By boat, up Boulder 1/4 mile
31.602					6/10/2002	275.3	By air up Boulder Cr. 1/4 mile
31.602					6/11/2002		No loc by boat 245-276, 199.5-163
31.602					6/12/2002		No loc by boat 177-122
31.602					6/12/2002		No loc by boat 245-275.3
31.602					6/17/2002	275.3	@ Boulder confluence
31.602					6/18/2002		Not found by boat 258.6-280
31.602					6/19/2002		No loc by boat 258.7-276
31.602					6/20/2002	275.3	@ Boulder confluence
31.602					6/21/2002	275.3	Up Boulder, got signal at 1st bend above RR trestle, weaker than 31.802
31.602					6/23/2002	275.3	Up Boulder

Appendix B. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.602					6/25/2002	275.3	Up Boulder, could hear from 1st bend upstream of RR trestle
31.602					6/27/2002		No loc by boat 258.5-276
31.602					6/28/2002	275.3	Up Boulder, could hear from 1st bend upstream of RR trestle
31.602					7/1/2002	275.3	Up Boulder, 1st bend upstream of RR trestle
31.602					7/6/2002		Tag off 7/2/02
31.602					9/30/2002	275.3	Up Boulder, 1st bend upstream of RR trestle
31.602					10/7/2002	275.3	Up Boulder, 1st bend upstream of RR trestle
31.602					10/15/2002	275.3	Up Boulder, 1st bend upstream of RR trestle
31.602					10/21/2002	275.3	Up Boulder, 1st bend upstream of RR trestle
31.602					11/4/2002	275.3	Up Boulder, 1st bend upstream of RR trestle
31.602					12/5/2002	275.3	Up Boulder, 1st bend upstream of RR trestle
31.624	368	unk	A	3/9/2003	4/3/2002	258.7	Released at Moyie R., swam off strong. Tag off 7/15 and on 10/16
31.624					4/8/2002	259.1	Just below first riffle (~500m) US of Moyie R.
31.624					4/10/2002	259.5	By air
31.624					4/12/2002	259.2	Approx. 600m us of Moyie
31.624					4/15/2002	259.3	By air
31.624					4/23/2002	259.0	By air
31.624					4/30/2002	265.2	By boat
31.624					5/3/2002	269.0	By air, above Moyie R
31.624					5/3/2002	268.3	By boat
31.624					5/5/2002	271.5	By boat
31.624					5/6/2002	271.5	By boat
31.624					5/9/2002	272.2	By boat, @ Curly Cr.
31.624					5/13/2002		By boat, not found 259.7 to 279
31.624					5/14/2002	283.5	Below Yaak
31.624					5/16/2002		Not found by boat (259.7-276)
31.624					5/18/2002	282.1	Just upstream of big house on bend
31.624					5/23/2002		Not found by plane (245-310)
31.624					5/27/2002		Not found by boat (258.5-277)
31.624					6/4/2002		Not found by air (245-310)
31.624					6/10/2002		No loc by air 245-310
31.624					6/11/2002		No loc by boat 245-276,199.5-163
31.624					6/12/2002		No loc by boat 177-122
31.624					6/12/2002		No loc by boat 245-275.3
31.624					6/17/2002		No loc by air 226-310
31.624					6/18/2002		Not found by boat 258.6-280
31.624					6/19/2002		No loc by boat 258.7-276
31.624					6/20/2002		No loc by boat 199.5-170, 258.5-276
31.624					6/20/2002		No loc by air 302-220
31.624					6/21/2002		No loc by boat 244.6-283.4
31.624					7/6/2002		Tag off 7/2/02
31.624					9/30/2002		No loc 245-310
31.624					10/7/2002		No loc 245-310
31.643	485	unk	J	5/3/2003	4/8/2002	244.5	Released 4/9, swam off strong.
31.643					4/12/2002	244.8	US search & rescue ~300m
31.643					4/10/2002	245.1	Up slightly
31.643					4/15/2002	244.7	Sewer line
31.643					4/23/2002		No loc 237.5-310
31.643					5/3/2002	272.5	Faint!
31.643					5/5/2002		No loc by boat 264-285.8
31.643					5/6/2002		No loc by boat 253.5-276
31.643					5/9/2002		No loc by boat 255-276
31.643					5/13/2002		No loc by boat 259.7 to 279
31.643					5/16/2002		No loc by boat 259.7 to 276
31.643					5/23/2002	272.6	By plane
31.643					6/4/2002		No loc by air 245 to 310
31.643					6/10/2002		No loc by air 245-310
31.643					6/11/2002		No loc by boat 245-276,199.5-163
31.643					6/12/2002		No loc by boat 177-122
31.643					6/12/2002		No loc by boat 245-275.3
31.643					6/17/2002		No loc by plane 226-310
31.643					6/18/2002		Not found by boat 258.6-280

Appendix B. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.643					6/19/2002		No loc by boat 258.7-276
31.643					6/20/2002		No loc by boat 199.5-170, 258.5-276
31.643					6/20/2002		No loc by air 302-220
31.643					6/21/2002		No loc by boat 244.6-283.4
31.643					6/24/2002		No loc by air 215-310
31.643					6/27/2002		No loc by boat 258.5-276
31.643					7/3/2002	109.0	In the lake; east side of lake about 0.6 mi. Offshore
31.643					7/6/2002		No loc by boat 258.5-277
31.643					8/15/2002	75.0	Approx. date; harvested in Kootenay Lake; approx 18 inches long, healthy
31.662	396	u	J	6/1/2002	5/1/2001	271.5	Tagged and released at Caboose Cr; took 45 min to recover from surgery.
31.662					5/2/2001	271.4	Boat loc
31.662					5/6/2001	270.6	Boat loc
31.662					5/10/2001	270.6	Boat loc
31.662					5/13/2001	270.8	Boat loc
31.662					5/18/2001	270.5	Aerial-below Caboose
31.662					5/21/2001	270.5	Boat loc
31.662					5/23/2001	270.7	Aerial-above Caboose
31.662					5/26/2001	270.7	Boat loc
31.662					5/30/2001	270.7	Below Caboose Cr.
31.662					6/11/2001	270.7	Below Caboose Cr.
31.662					6/20/2001	271.6	At Caboose Cr.
31.662					6/26/2001	270.0	Boat loc
31.662					7/5/2001	270.6	At Caboose Cr.
31.662					7/11/2001	270.6	At Caboose Cr.
31.662					7/25/2001	270.6	At Caboose Cr.
31.662					8/1/2001	270.6	At Caboose Cr.
31.662					8/8/2001	270.6	Same
31.662					8/16/2001	270.6	At Caboose Cr.
31.662					8/22/2001	270.6	At Caboose Cr.-good signal
31.662					8/29/2001	270.6	At Caboose Cr.-good signal
31.662					9/7/2001	270.6	At Caboose Cr.-good signal
31.662					9/24/2001	270.6	At Caboose Cr.-good signal
31.662					10/3/2001	270.6	At Caboose Cr.-good signal
31.662					10/10/2001	270.6	At Caboose Cr.-good signal
31.662					10/17/2001	270.0	Downstream
31.662					10/24/2001	270.6	Up slightly
31.662					11/5/2001	270.6	Same
31.662					12/12/2001	270.6	Above Caboose; good signal
31.662					12/27/2001	270.6	
31.662					2/14/2002	270.6	
31.662					3/13/2002	293	Brush Cr.
31.662					4/10/2002	297.5	Up, sewage pond
31.662					4/15/2002	299.5	@ Callahan
31.662					4/23/2002	293.5	Moved down near Brush Cr.
31.662					5/3/2002	293.5	Near Brush Cr.
31.662					5/14/2002	293.5	Near Brush Cr.
31.662					5/23/2002	293.5	By plane
31.662					6/4/2002	293.5	By plane
31.662					6/10/2002	293.5	By plane
31.662					6/11/2002		No loc by boat 244.5-276, 199.5-163
31.662					6/12/2002		No loc by boat 177-122
31.662					6/12/2002		No loc by boat 245-275.3
31.662					6/17/2002	293.2	@ Brush Cr. confluence in KR
31.662					6/18/2002		Not found by boat 258.6-280
31.662					6/19/2002		No loc by boat 258.7-276
31.662					6/20/2002	293.2	@ Brush Cr. confluence in KR
31.662					6/24/2002	293.2	@ Brush Cr. confluence in KR
31.662					7/1/2002	293.2	@ Brush Cr. confluence in KR
31.662					7/15/2002	293.2	@ Brush Cr. confluence in KR
31.662					7/22/2002	293.2	@ Brush Cr. confluence in KR
31.662					7/29/2002	293.2	@ Brush Cr. confluence in KR
31.662					8/5/2002	293.2	@ Brush Cr. confluence in KR

Appendix B. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.662					8/12/2002	293.2	@ Brush Cr. confluence in KR
31.662					8/19/2002	293.2	@ Brush Cr. confluence in KR
31.662					8/26/2002	293.2	@ Brush Cr. confluence in KR
31.662					9/3/2002	293.2	@ Brush Cr. confluence in KR
31.662					9/9/2002	293.2	@ Brush Cr. confluence in KR, weak signal
31.662					9/16/2002	293.2	@ Brush Cr. confluence in KR, weak signal
31.662					9/23/2002	293.2	@ Brush Cr. confluence in KR, weak signal
31.662					9/30/2002	293.2	@ Brush Cr. confluence in KR, weak signal
31.662					10/7/2002	293.2	@ Brush Cr. confluence in KR, weak signal
31.662					10/15/2002	293.2	@ Brush Cr. confluence in KR, weak signal
31.662					10/21/2002	293.2	@ Brush Cr. confluence in KR, weak signal
31.662					11/4/2002	293.2	@ Brush Cr. confluence in KR, weak signal
31.662					12/5/2002	293.2	@ Brush Cr. confluence in KR, weak signal
31.683	409	unk	J	5/6/2003	4/11/2002	268.6	Released 4/12/02 at Debt Cr.
31.683					5/3/2002	272.6	By boat, faint!
31.683					5/5/2002	272.2	By boat, just below Curley, faint!
31.683					5/6/2002	272.1	By boat, just below Curley, faint!
31.683					5/9/2002	272.1	By boat, just below Curley, faint!
31.683					5/13/2002	271.6	By boat, moved downstream
31.683					5/14/2002	271.6	By air
31.683					5/16/2002	268.4	By boat, at Debt Cr.
31.683					5/18/2002	268.5	Approx. 50-100m upstream of Debt Cr.
31.683					5/21/2002	269.5	By boat
31.683					5/23/2002	268.5	By plane
31.683					5/27/2002	268.5	By boat
31.683					5/29/2002	268.5	By air
31.683					5/30/2002	268.4	By boat
31.683					5/31/2002	268.6	Above Debt Cr.
31.683					6/3/2002	268.4	By boat, at Debt Cr.
31.683					6/4/2002	268.4	By air
31.683					6/5/2002	268.3	Just below Debt Cr.
31.683					6/6/2002	268.3	Below Debt Cr.
31.683					6/10/2002	268.5	Upstream Debt Cr.
31.683					6/12/2002	268.4	Upstream Debt Cr.
31.683					6/17/2002	268.5	Between Debt & Powerline
31.683					6/18/2002		Not found by boat 258.6-280
31.683					6/19/2002	268.4	No loc by boat 258.7-276
31.683					6/20/2002	268.4	Near Debt
31.683					6/24/2002	268.4	Near Debt
31.683					6/27/2002	268.4	Near Debt
31.683					7/1/2002	268.4	Near Debt
31.683					7/6/2002	268.4	Near Debt
31.683					7/10/2002	268.4	Near Debt
31.683					7/15/2002	268.4	Near Debt
31.683					7/22/2002	268.4	Near Debt
31.683					7/23/2002	268.6	Near Debt
31.683					7/29/2002	268.4	Near Debt
31.683					8/5/2002	268.4	Near Debt
31.683					8/12/2002	268.4	Near Debt
31.683					8/19/2002	268.0	Downriver some
31.683					8/22/2002	268.4	Near Debt
31.683					8/26/2002	268.4	Near Debt
31.683					9/3/2002	268.4	Near Debt
31.683					9/16/2002	268.4	Near Debt
31.683					9/23/2002	268.4	Near Debt
31.683					9/30/2002	268.4	Near Debt
31.683					10/7/2002	268.4	Near Debt
31.683					10/15/2002	268.4	Near Debt
31.683					10/21/2002	268.4	Near Debt
31.683					11/4/2002	268.4	Near Debt
31.683					12/5/2002	268.4	Near Debt
31.702	429	unk	J	5/6/2003	4/11/2002	270.6	Released on 4/12/02 at Caboose Cr.
31.702					5/3/2002		No loc by boat 240-276
31.702					5/5/2002		No loc by boat 264-285.8
31.702					5/6/2002		No loc by boat 253.5-276

Appendix B. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.702					5/9/2002		No loc by boat 255-276
31.702					5/13/2002		No loc by boat 259.7 to 279
31.702					5/16/2002		No loc by boat 259.7 to 277
31.702					5/23/2002		No loc by plane 245 to 310
31.702					6/4/2002		No loc by plane 245 to 311
31.702					6/10/2002		No loc by plane 245 to 311
31.702					6/17/2002		No loc by plane 226-310
31.702					6/20/2002		No loc by boat 199.5-170, 258.5-276
31.702					6/21/2002		No loc by boat 244.6-283.4
31.702					6/24/2002		No loc by air 245-310
31.702					6/27/2002		No loc by boat 258.5-276
31.702					7/11/2002		No loc by boat 170-245
31.702					7/12/2002		No loc by boat 245-276
31.702					9/18/2002		No loc 132-76-122; 132-170
31.702					9/30/2002		No loc 245-310
31.702					10/7/2002		No loc 245-310
31.722	485	f	J	5/27/2003	5/2/2002	266.6	Released 5/3/02
31.722					5/5/2002	268.6	~200 m upstream Debt Cr.
31.722					5/6/2002	269.5	By boat
31.722					5/9/2002	269.5	By boat
31.722					5/13/2002	269.5	By boat
31.722					5/14/2002	275.2	Near confluence of Boulder Cr.
31.722					5/16/2002	275.2	At Boulder Cr.
31.722					5/18/2002	275	Near Boulder Cr. in Kootenai R. Couldn't get a consistent signal.
31.722					5/23/2002	275.6	By plane
31.722					5/27/2002		Not found by boat (258.5-277)
31.722					5/31/2002		Not found 258.7 to 285.7
31.722					6/3/2002		Not found by boat (258.5-275)
31.722					6/4/2002	275.3	Up Boulder Cr. 1 to 1 1/4 miles
31.722					6/5/2002	275.3	Up Boulder Cr. 1 to 1 1/4 miles
31.722					6/6/2002	275.3	Up Boulder Cr. 1 to 1 1/4 mile
31.722					6/10/2002		Not found by air 245-310
31.722					6/11/2002	177.2	By boat
31.722					6/12/2002	177.2	By boat
31.722					6/20/2002	177.2	By boat
31.722					6/20/2002		No loc by air 215-192
31.722					6/27/2002	177.4	By boat
31.722					7/3/2002	177.4	By air
31.722					7/11/2002	177.3	By boat
31.722					8/5/2002	177.3	By air
31.722					8/16/2002	177.3	By air
31.722					9/16/2002	177.3	Dwnstrm mouth of Smith Cr.
31.722					10/2/2002	177.5	Dwnstrm mouth of Smith Cr.
31.722					10/15/2002	177.5	Dwnstrm mouth of Smith Cr.
31.722					12/3/2002		Gone
31.802	506	m	K	12/23/2003	5/2/2002	266.6	Released 5/3/02
31.802					5/5/2002	262.3	By boat
31.802					5/6/2002	261.4	By boat
31.802					5/9/2002	256.1	By boat, moved down!
31.802					5/13/2002	262.5	By boat, @ Hemlock Bar
31.802					5/14/2002	272.3	By air, moved up, lots of static
31.802					5/16/2002	275.2	At Boulder Cr., faint possibly up Boulder Cr.
31.802					5/18/2002	275.5	Up Boulder Cr. 75 upstream of RR bridge
31.802					5/23/2002	275.5	By plane
31.802					5/27/2002	275.5	By boat
31.802					5/30/2002	275.3	Up Boulder Cr. ~50 m upstream of RR trestle
31.802					5/31/2002	275.3	Up boulder, couldn't hear by boat
31.802					6/3/2002	275.3	Up Boulder Cr. ~200 m upstream of RR trestle
31.802					6/4/2002	275.3	Up Boulder Cr. 3/4 mile
31.802					6/5/2002	275.3	Up Boulder Cr. 3/4 mile
31.802					6/6/2002	275.3	Up Boulder Cr. 3/4 mile
31.802					6/10/2002	275.3	Up Boulder Cr. 1/4 mile
31.802					6/11/2002		No loc by boat 245-276, 199.5-163
31.802					6/12/2002		No loc by boat 177-122

Appendix B. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.802					6/12/2002	275.3	Up boulder
31.802					6/17/2002	275.3	Up boulder 1/3 mi.
31.802					6/18/2002		Not found by boat 258.6-280
31.802					6/19/2002		No loc by boat 258.7-276
31.802					6/20/2002	275.3	Up boulder 1/3 mi.
31.802					6/21/2002	275.3	Up boulder, 1st bend above RR trestle
31.802					6/23/2002	275.3	Up boulder
31.802					6/24/2002	275.3	Up boulder to ~0.9 mi.
31.802					6/25/2002		No loc by boat 258-275.5
31.802					6/27/2002		No loc by boat 258.5-276
31.802					7/6/2002		No loc by boat 258.5-277
31.802					7/11/2002		No loc by boat 170-245
31.802					7/12/2002		No loc by boat 246-276
31.802					7/22/2002		No loc 199-310
31.802					7/29/2002		No loc 199-310
31.802					9/18/2002		No loc 132-76-122; 132-170
31.802					9/30/2002		No loc 245-310
31.802					10/7/2002		No loc 245-310

[a] For sex: m = male, f = female, u = unknown.

[b] A = tag wt 7.35-8.2 g, 90 on/90 off/160 on duty cycle, life of 250 d; C = tag wt 10-11 g, life of 360 d; D = tag wt 18.36-18.81 g, life of 730 d; E = tag wt 25.1-25.31 g, life of 912 d; F = tag wt 20.2 g, life of 690 d; G = tag wt 25.1 g, life of 1000 d; H = tag wt 7.8 g, 90 d on/90 d off/ on until tag dead, life of 250 d; J = tag wt 10.4 g, life of 360 d.

[c] The first location listed for each fish is the release location.

Appendix C. Telemetry locations for radio-tagged bull trout with active transmitters in 2002.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
30.080	514	u	F	11/14/2003	12/14/2001	237.0	Caught on 12/12/01 at rkm 236.9 in hoop net; used MS-222; released in 14' of water; water temp 6
30.080					12/15/2001	232.3	By boat at 11:45; very weak signal-approx location
30.080					12/17/2001	219.7	By boat at rkm 220 at 11:30-couldn't keep a strong signal, reception range about 100 m; by 12:05 fish had move to rkm 219.7
30.080					12/21/2001		Not located by boat from rkm 188.5-222
30.080					12/27/2001	184.8	Aerial
30.080					12/28/2001		No loc 150 (Creston boat ramp)-173.5; by boat
30.080					1/3/2002		No loc by boat rkm 149.8-185.2
30.080					1/9/2002		No loc by air rkm 122-246
30.080					1/16/2002	207.2	By boat at 13:40; water temp = 6; depth = 67'; in same hole as a tagged burbot
30.080					1/21/2002		No loc by boat rkm 240.3-206.4 (Fischer Cr.); water temp = 4
30.080					1/30/2002		No loc by boat rkm 234.7-240.3 and 177.5-207.5
30.080					2/8/2002		No loc Smith Cr. to rkm 144 Nicks Is. by boat
30.080					4/10/2002	205.0	Front side of Ferry Island
30.080					415/02	199.5	Copeland
30.080					6/11/2002		Not found rkm 244.5-276
30.080					6/12/2002		No loc by boat 177-122
30.080					6/20/2002		No loc by boat 199.5-170, 258.5-276
30.080					6/20/2002		No loc by air 215-192
30.080					6/21/2002		No loc by boat 244.6-283.4
30.080					6/24/2002		No loc by air 245-310
30.080					7/11/2002		Not found 170-245
30.080					7/12/2002		Not found 246-276
30.080					7/15/2002		Not found 165-275
30.080					9/18/2002		No loc 132-76-122; 132-170
30.080					9/23/2002		No loc 245-305; 245-205
30.080					9/30/2002		No loc 245-310
30.080					10/7/2002		No loc 245-310
30.140	495	u	F	8/21/2002	9/21/2000	270.5	Caboose Ck
30.140					9/26/2000	272.3	Below Curley Ck
30.140					10/10/2000	271.5	Below Curley Ck
30.140					10/17/2000	272.6	Above Curley; boat loc
30.140					10/26/2000	271.0	Below Curley Ck
30.140					11/21/2000	271.0	Below Curley Ck
30.140					3/23/2001	272.2	Below Curley Ck—boat
30.140					3/27/2001	272.2	Below Curley Ck—boat
30.140					4/2/2001	272.1	Below Curley Ck—boat
30.140					4/9/2001	272.1	Below Curley Ck—boat
30.140					4/16/2001	271.3	Below Curley Ck—boat
30.140					4/23/2001	271.2	Below Curley Ck—boat
30.140					4/30/2001	272.2	Boat
30.140					5/2/2001	272.2	At Curley Cr.
30.140					5/10/2001	271.5	Boat
30.140					5/13/2001	271.2	Boat
30.140					5/18/2001	271.7	Below Curley Cr.
30.140					5/21/2001	271.7	Boat
30.140					5/23/2001	271.7	Aerial
30.140					5/26/2001	271.0	Boat
30.140					5/30/2001	271.7	Below Curley Cr.
30.140					6/11/2001	271.7	Below Curley Cr.
30.140					6/20/2001	271.9	Between Caboose and Curley
30.140					6/26/2001	271.5	Boat
30.140					7/5/2001		No loc-245-310
30.140					7/11/2001		No loc-245-310
30.140					7/18/2001		No loc 245-310
30.140					7/25/2001		No loc-245-310
30.140					8/1/2001	271.5	Aerial
30.140					8/8/2001		No loc 245-310
30.140					8/29/2001		No loc 245-303

Appendix C. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
30.140					9/7/2001		No loc
30.140					9/24/2001		No loc
30.140					10/3/2001	293.3	Brush Cr. (above) in KR, faint
30.140					10/10/2001		No loc 245-305
30.140					10/17/2001		No loc 245-310
30.140					10/24/2001		No loc 245-305
30.140					11/5/2001		No loc 245-305
30.140					12/12/2001		No loc
30.140					12/27/2001		No loc 121-303.5
30.140					2/14/2002	271.6	
30.140					3/13/2002	271.6	Faint!
30.140					4/10/2002	271.6	Air loc
30.140					4/15/2002	271.6	Below Curley Cr., faint.
30.140					4/23/2002	271.6	Below Curley Cr., faint.
30.140					5/3/2002	271.8	By boat, faint.
30.140					5/5/2002	271.6	By boat, faint.
30.140					5/6/2002	271.6	By boat, faint.
30.140					5/9/2002	270.7	By boat, @ Caboose Cr
30.140					5/13/2002	271.8	By boat, faint, moved up
30.140					5/14/2002	271.8	By air
30.140					5/16/2002	271.8	By boat
30.140					5/18/2002	271.5	Weak signal
30.140					5/23/2002	271.5	By plane
30.140					5/27/2002	271.7	By boat
30.140					5/30/2002	271.7	By boat
30.140					5/31/2002		Not found by boat (rkm 258.7 to 285.5), possible dead battery?
30.140					6/3/2002		Not found by boat, rkm 258.7 to 275
30.140					6/4/2002	270.6	In Caboose Cr.?
30.140					6/5/2002		Not found
30.140					6/6/2002		Not found by boat (rkm 258.7 to 285.5), possible dead battery?
30.140					6/10/2002		Not located by air 245-310
30.140					6/12/2002		No loc by boat 245-275.3
30.140					6/17/2002	224.5	Fixed loc at Flemming Cr.
30.140					6/18/2002		No loc by boat 258.6-280
30.140					6/19/2002		No loc by boat 258.7-276
30.140					6/20/2002		No loc by boat 258.7-276, 199.5-170.0
30.140					6/20/2002		No loc by air 302-192
30.140					6/21/2002		No loc by boat 244.6-283.4
30.140					6/24/2002		No loc by air 245-310
30.140					7/11/2002		No loc by boat 170-245
30.140					7/12/2002		No loc by boat 246-276
30.140					7/23/2002		Fixed loc at Flemming Cr.
30.160	478	u	F	3/13/2004	4/23/2002	264.8	Released at lower hemlock bar
30.160					4/30/2002		Not loc 253-276
30.160					5/3/2002	264.9	By boat
30.160					5/5/2002	265.1	By boat, at Katka Cr.
30.160					5/6/2002	264.1	By boat
30.160					5/9/2002	264.8	By boat, at Katka Cr.
30.160					5/13/2002	265.0	By boat, just upstream of Katka Cr.
30.160					5/16/2002	265.0	By boat
30.160					5/18/2002	264.8	Right @ Katka Cr.
30.160					5/21/2002	265.2	By boat
30.160					5/27/2002	265.0	By boat
30.160					5/29/2002	265.0	By air
30.160					5/30/2002	265.1	By boat
30.160					5/31/2002	265.1	By boat, at Katka Cr.
30.160					6/3/2002	265.3	By boat
30.160					6/4/2002	265.3	By air
30.160					6/5/2002	265.3	By boat
30.160					6/6/2002	265.3	By boat
30.160					6/10/2002	265.3	By air
30.160					6/12/2002	265.2	20 m US Katka
30.160					6/17/2002	265.2	20 m US Katka

Appendix C. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
30.160					6/18/2002	265.2	20 m US Katka
30.160					6/19/2002	265.2	20 m US Katka
30.160					6/20/2002	265.2	20 m US Katka
30.160					6/24/2002	265.2	20 m US Katka
30.160					6/27/2002	265.2	20 m US Katka
30.160					7/1/2002	264.9	Near Katka
30.160					7/3/2002	264.9	At mouth of Katka Cr.
30.160					7/6/2002	265.3	50 m upstream of Katka Cr.
30.160					7/10/2002	264.9	At mouth of Katka Cr.
30.160					7/15/2002	264.9	Near Katka
30.160					7/22/2002	264.9	Near Katka
30.160					7/23/2002	265.3	By boat
30.160					7/25/2002	267.7	Moved upriver
30.160					7/26/2002	268.0	Moved upriver
30.160					7/29/2002	268.0	Below Debt
30.160					7/31/2002	265.2	Moved downriver
30.160					8/3/2002	265.2	Same
30.160					8/5/2002	273.5	Up below boulder
30.160					8/12/2002	265.3	Above Katka
30.160					8/19/2002	265.3	Above Katka
30.160					8/22/2002		No loc by boat
30.160					8/26/2002	264.5	Below Katka
30.160					9/3/2002	264.5	Below Katka
30.160					9/9/2002	264.5	Below Katka
30.160					9/16/2002	264.5	Below Katka
30.160					9/23/2002	264.5	Below Katka
30.160					9/30/2002	264.5	Below Katka
30.160					10/7/2002	264.5	Below Katka
30.160					10/15/2002	264.5	Below Katka
30.160					10/21/2002	264.5	Below Katka
30.160					11/4/2002	264.5	Below Katka
30.160					12/3/2002	264.5	Below Katka
30.191	800	m	D	10/8/2001	10/8/1999	301.2	Capt @ O'Brien
30.191					10/14/1999	304.8	Throop Lake
30.191					10/19/1999	305.1	Throop Lake; weak signal
30.191					10/26/1999	305.1	Throop Lake; weak signal
30.191					11/1/1999	305.8	Upstream from Throop L
30.191					11/9/1999	305.8	Upstream from Throop L
30.191					11/29/1999	304.5	Throop Lake
30.191					12/14/1999	304.5	Throop Lake
30.191					1/18/2000	304.7	Dwnstrm end of island
30.191					2/15/2000	304.7	Dwnstrm end of island
30.191					3/21/2000	304.7	Dwnstrm end of island
30.191					4/11/2000	305.1	Upstream end of island
30.191					4/24/2000	305.1	Upstream end of island
30.191					5/2/2000	305.1	Upstream end of island
30.191					5/9/2000	305.2	Upstream end of island
30.191					5/16/2000	305.2	Upstream end of island
30.191					5/23/2000	305.2	Upstream end of island
30.191					5/30/2000	305.2	Upstream end of island
30.191					6/6/2000	305.2	Upstream end of island
30.191					6/20/2000		No location
30.191					6/28/2000	307.5	Moved into canyon
30.191					7/5/2000	305.1	Upstream end of island
30.191					7/11/2000	309.5	Into canyon
30.191					7/18/2000	305.1	Upstream end of island
30.191					8/1/2000	305.1	Upstream end of island
30.191					8/8/2000	305.1	Upstream end of island
30.191					8/15/2000	305.1	Upstream end of island
30.191					8/22/2000	305.1	Upstream end of island
30.191					8/29/2000	305.1	Upstream end of island
30.191					9/5/2000	305.1	Upstream end of island
30.191					9/12/2000	305.1	Upstream end of island
30.191					9/26/2000	305.1	Upstream end of island
30.191					10/26/2000	304.7	Dwnstrm end of island

Appendix C. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
30.191					11/21/2000	304.7	Dwnstrm end of island
30.191					1/4/2001	304.7	
30.191					3/28/2001	304.7	Dwnstrm end of island
30.191					4/11/2001	304.7	Dwnstrm end of island
30.191					4/18/2001	304.7	Dwnstrm end of island
30.191					4/25/2001	304.7	Dwnstrm end of island
30.191					5/18/2001	304.7	Dwnstrm end of island
30.191					5/30/2001	304.7	Dwnstrm end of island
30.191					6/11/2001	304.7	Dwnstrm end of island
30.191					7/5/2001	308.5	Into canyon
30.191					7/11/2001	309.7	Top of K. Falls
30.191					7/18/2001	309.7	Same
30.191					7/25/2001	309.7	Top of K. Falls
30.191					8/1/2001	309.7	Top of K. Falls
30.191					8/8/2001	301.2	Down river to confluence of O'Brien
30.191					8/16/2001	301.1	Slightly below O'Brien
30.191					8/22/2001	301.1	Slightly below O'Brien- good signal
30.191					8/29/2001	301.0	Slightly below O'Brien
30.191					9/7/2001	301.0	Slightly below O'Brien
30.191					9/24/2001	300.1	Below O'Brien, good signal
30.191					10/3/2001	300.1	Below O'Brien, good signal
30.191					10/10/2001	300.3	@ Lake Cr
30.191					10/17/2001	300.3	@ Lake Cr
30.191					10/24/2001	300.3	Below O'Brien, good signal
30.191					11/5/2001	300.3	Below O'Brien, good signal
30.191					12/12/2001	303.5	Moved above bend
30.191					12/27/2001	303.5	Above bend
30.191					2/14/2002	303.5	Above bend
30.191					3/13/2002	303.5	Above bend
30.191					4/10/2002	303.5	Above bend
30.191					4/15/2002	303.5	Above bend
30.191					4/23/2002	303.5	Above bend
30.191					5/23/2002	303.5	Above bend
30.191					6/4/2002	303.5	Above bend
30.191					6/10/2002	303.5	Above bend
30.191					6/24/2002	303.5	Above bend
30.191					7/1/2002	307.3	Up to canyon
30.191					7/15/2002	305.2	@ House
30.191					7/22/2002	304.5	Down from O'Brien
30.191					7/29/2002	299.3	@ Callahan confluence
30.191					8/5/2002	301.0	@ O'Brien
30.191					8/12/2002	301.0	@ O'Brien
30.191					8/19/2002		Gone? Off?
30.191					8/26/2002	301.2	Just upstream of O'Brien
30.191					9/3/2002	304.0	Upriver ~3 rkm
30.191					9/16/2002	304.0	In KR, faint
30.191					9/23/2002	304.0	In KR, faint
30.191					9/30/2002	304.0	In KR, faint
30.191					10/7/2002	304.0	In KR, faint
30.191					10/15/2002	304.0	In KR, faint
30.191					10/21/2002	304.0	In KR, faint
30.191					11/4/2002	304.0	In KR, faint
30.191					12/5/2002	304.0	In KR, faint
30.231	595	u	G	12/1/2003	3/6/2001	244.5	Captured in hoop net on 3/5 at Ambush Rock; used clove oil-fish "knocked out" quick and recovered quick (within 1 min.); did well during surgery (no movement, consistent gilling); swam away-looked healthy; stitched muscle layer together (w/ prolene), then stitched skin together. No bleeding
30.231					3/9/2001		Not located-searched near release point only-rkm 244.5
30.231					3/14/2001		Not located
30.231					3/22/2001		Not located-searched near release point only-rkm 244.5
30.231					3/28/2001		Not located—aerial, 305-122

Appendix C. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
30.231					4/11/2001		Not located—aerial, 305-122
30.231					4/18/2001		Not located—aerial, 305-170
30.231					4/25/2001		Not located—aerial, 170-310
30.231					5/2/2001		Not located—aerial, 150-285 and Deep Cr.
30.231					5/9/2001	132.0	Near E. Channel
30.231					5/31/2001	131.5	Bend below E. Channel
30.231					7/18/2001	131.5	Bend below E. Channel
30.231					12/27/2001	131.8	Approx. location
30.231					2/13/2002	131.5	Bend below E. Channel
30.231					4/15/2002	131.5	Bend below E. Channel
30.231					6/12/2002		No loc by boat 177-122
30.231					6/20/2002		No loc by boat 199.5-170, 258.5-276
30.231					7/3/2002	131.8	By air
30.231					7/11/2002		No loc by boat 170-245
30.231					7/12/2002		No loc by boat 245-276
30.231					7/15/2002	131.8	By air
30.231					8/16/2002	131.8	By air
30.231					9/18/2002	131.5	By air
30.241	459	u	D	9/15/2001	9/15/1999	262.5	Capt @ Hemlock Bar
30.241					9/17/1999	264.1	Powerline above bar
30.241					9/21/1999	262.0	@ bend below Hemlock Bar
30.241					9/28/1999	262.0	Bend below Hemlock Bar
30.241					10/5/1999	262.0	Bend below Hemlock Bar
30.241					10/14/1999	262.0	Bend below Hemlock Bar
30.241					10/19/1999	262.0	Bend below Hemlock Bar
30.241					10/26/1999	262.0	Bend below Hemlock Bar
30.241					11/1/1999	262.0	Bend below Hemlock Bar
30.241					11/9/1999	262.5	@ Hemlock Bar
30.241					11/29/1999	262.5	@ Hemlock Bar
30.241					12/14/1999	262.0	Bend below Hemlock Bar
30.241					1/18/2000	262.0	Bend below Hemlock Bar
30.241					2/15/2000	262.0	Bend below Hemlock Bar
30.241					3/21/2000	262.0	Bend below Hemlock Bar
30.241					4/11/2000	262.0	Bend below Hemlock Bar
30.241					4/24/2000	262.0	Bend below Hemlock Bar
30.241					5/2/2000	262.2	Bend below Hemlock Bar
30.241					5/9/2000	262.0	Bend below Hemlock Bar
30.241					5/16/2000	262.0	Bend below Hemlock Bar
30.241					5/23/2000	262.0	Bend below Hemlock Bar
30.241					5/30/2000	262.0	Bend below Hemlock Bar
30.241					6/6/2000	262.0	Bend below Hemlock Bar
30.241					6/13/2000	262.0	Bend below Hemlock Bar
30.241					6/20/2000	262.0	Bend below Hemlock Bar
30.241					6/28/2000	262.0	Bend below Hemlock Bar
30.241					6/30/2000	262.0	Bend below Hemlock Bar
30.241					7/5/2000	262.0	Bend below Hemlock Bar
30.241					7/11/2000	276.1	Above Leonia Bridge
30.241					7/18/2000	301.2	O'Brien Ck confluence-in KR
30.241					8/1/2000	301.2	O'Brien Ck confluence-in KR
30.241					8/8/2000	301.2	O'Brien Ck confluence-in KR
30.241					8/15/2000	301.2	O'Brien Ck confluence-in KR
30.241					8/22/2000	301.2	O'Brien Ck confluence-in KR
30.241					8/29/2000	300.3	Below O'Brien Ck confluence
30.241					9/5/2000	300.3	Below O'Brien Ck confluence
30.241					9/12/2000	294.4	Just above hwy bridge
30.241					9/26/2000	293.2	Brush Ck, in KR
30.241					10/10/2000	293.2	Brush Ck, in KR
30.241					10/26/2000	293.2	Brush Ck, in KR
30.241					11/21/2000	293.2	Brush Ck, in KR
30.241					1/4/2001	265.0	Bend below Hemlock Bar
30.241					3/23/2001	262.0	Boat
30.241					3/27/2001	262.1	Boat
30.241					4/2/2001	262.0	Boat
30.241					4/9/2001	262.0	Boat
30.241					4/11/2001	264.5	

Appendix C. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
30.241					4/16/2001	262.0	Boat
30.241					4/23/2001	262.0	Boat
30.241					4/30/2001	262.0	Boat
30.241					5/6/2001	262.0	Boat
30.241					5/10/2001	262.0	Boat
30.241					5/13/2001	262.0	Boat
30.241					5/18/2001	262.1	@ bend below Hemlock Bar
30.241					5/21/2001	262.1	Boat
30.241					5/23/2001	262.1	Aerial
30.241					5/26/2001	262.0	Boat
30.241					5/30/2001	262.1	At bend
30.241					6/11/2001	282.0	Moved upriver
30.241					6/20/2001	301.2	O'Brien and KR
30.241					7/5/2001	301.2	Up O'Brien ~1.5 mi
30.241					7/11/2001	301.2	Up O'Brien ~2.25 mi
30.241					7/18/2001	301.2	Now about 4.1 mi up O'Brien
30.241					7/25/2001	301.2	Up O'Brien ~4.1 mi
30.241					8/1/2001	301.2	Up O'Brien ~4.1 mi
30.241					8/8/2001	301.2	Up O'Brien ~4.1 mi
30.241					8/16/2001	301.2	Up O'Brien ~4.1 mi
30.241					8/22/2001	301.2	Up O'Brien ~4.1 mi- faint
30.241					8/29/2001	301.2	Up O'Brien ~4.2 mi- faint
30.241					9/7/2001	301.2	Up O'Brien ~4.2 mi- faint
30.241					9/24/2001	301.2	Up O'Brien ~4.2 mi- faint
30.241					10/3/2001	301.2	Up O'Brien ~4.2 mi- faint
30.241					10/10/2001	301.2	Up O'Brien ~4.2 mi- faint
30.241					10/17/2001	301.2	Up O'Brien ~2 mi.- faint
30.241					10/24/2001	301.2	Up O'Brien ~1.5 mi- down slightly
30.241					11/5/2001	301.2	Lynx Cr
30.241					12/12/2001	301.2	Up O'Brien at Lynx Cr. confluence
30.241					12/27/2001	301.2	Up O'Brien, slightly above Lynx Cr.
30.241					2/14/2002	301.2	Up O'Brien, slightly above Lynx Cr.
30.241					3/13/2002	301.2	Up O'Brien, slightly above Lynx Cr.
30.241					4/15/2002	301.2	Up O'Brien, slightly above Lynx Cr.
30.474	690	u	E	4/1/2002	10/1/1999	301.2	Capt @ O'Brien
30.474					10/5/1999	300.2	@ Lake Ck, in KR
30.474					10/14/1999	275.1	Just below Boulder Cr
30.474					10/19/1999	258.4	Just below Moyie River
30.474					10/26/1999		Not located
30.474					11/1/1999		Not located
30.474					11/9/1999	258.6	Up Moyie ~ 1/8 mi
30.474					11/29/1999	258.6	Up Moyie ~ 1/8 mi
30.474					12/14/1999	259.0	In KR above Moyie
30.474					1/18/2000	262.2	Below Hemlock
30.474					2/15/2000	262.2	Below Hemlock
30.474					3/21/2000	262.2	Below Hemlock
30.474					4/11/2000	262.2	
30.474					4/17/2000	259.4	
30.474					4/24/2000	258.7	Moyie confluence
30.474					5/2/2000	261.3	
30.474					5/9/2000	262.0	Bend below Hemlock
30.474					5/16/2000	266.9	Bend below Curley Cr
30.474					5/23/2000	262.0	
30.474					5/30/2000	258.6	@ Moyie confluence
30.474					6/6/2000	258.6	Up Moyie ~ 1/2 mi.
30.474					6/13/2000	258.6	Up Moyie ~ 1/2 mi.
30.474					6/20/2000		No location
30.474					6/28/2000	258.5	@ Moyie, in Kootenai
30.474					6/30/2000	268.4	
30.474					7/5/2000	275.5	Confluence Boulder, in KR
30.474					7/11/2000	294.6	Above Hwy bridge
30.474					7/18/2000	299.5	Callahan Ck confluence
30.474					8/1/2000	300.3	In Lake Ck, above Hwy
30.474					8/8/2000	301.2	Confluence of O'Brien Ck.
30.474					8/15/2000	301.2	Confluence of O'Brien Ck.

Appendix C. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
30.474					8/22/2000	301.1	Confluence of O'Brien Ck.
30.474					8/29/2000	301.1	Confluence of O'Brien Ck.
30.474					9/5/2000	301.1	Confluence of O'Brien Ck.
30.474					9/12/2000	300.5	Below confluence of O'Brien Ck.
30.474					9/26/2000	300.5	Below confluence of O'Brien Ck.
30.474					10/10/2000	300.5	Below confluence of O'Brien Ck.
30.474					10/26/2000	285.0	Bend below Yaak
30.474					1/4/2001	287.0	Above Yaak confluence
30.474					4/11/2001	287.0	Above Yaak confluence
30.474					4/18/2001	287.5	Above Yaak confluence
30.474					4/25/2001	288.0	Above Yaak
30.474					5/18/2001	295.0	Aerial-moved up
30.474					5/23/2001	296.0	Aerial-below island
30.474					5/30/2001	297.3	Aerial
30.474					6/11/2001	297.3	Aerial
30.474					6/20/2001	301.2	O'Brien and KR
30.474					7/5/2001	301.2	O'Brien and KR
30.474					7/11/2001	301.2	O'Brien and KR (in KR)
30.474					7/18/2001	301.2	O'Brien and KR (in KR)
30.474					7/25/2001		No loc 245-310
30.474					8/1/2001	299.8	Below O'Brien
30.474					8/8/2001	299.8	Same
30.474					8/16/2001	301.1	Slightly below O'Brien
30.474					8/22/2001	301.1	Slightly below O'Brien- good signal
30.474					8/29/2001	301.0	Slightly below O'Brien- good signal
30.474					9/7/2001	301.0	Slightly below O'Brien- good signal
30.474					9/24/2001	300.1	Below O'Brien, good signal
30.474					10/3/2001	300.1	Below O'Brien, good signal
30.474					10/10/2001	300.3	@ Lake cr. In KR
30.474					10/17/2001	300.4	Upstream a bit
30.474					10/24/2001	295.0	Above highway
30.474					11/5/2001	297.3	Up slightly
30.474					12/12/2001	293.0	At Brush Creek
30.474					12/27/2001	292.2	
30.474					2/14/2002	292.3	Below Brush Cr.
30.474					3/13/2002	295.0	Up above bridge
30.474					4/10/2002	292.7	Below bridge
30.474					4/15/2002	293.0	@ Brush Cr.
30.474					4/23/2002	293.1	@ Brush Cr.
30.474					5/23/2002	297.0	By plane
30.474					6/4/2002	296.6	Up slightly
30.474					6/10/2002	296.6	By plane
30.474					6/17/2002	280.0	Down ~16 rkm (near Pine Cr.)
30.474					6/18/2002	280.0	Near Pine Cr.
30.474					6/20/2002	280.0	Near Pine Cr.
30.474					6/21/2002		No loc by boat 244.6-283.4
30.474					6/23/2002		No loc by boat 258.5-276
30.474					6/24/2002		No loc by air 215-310
30.474					7/1/2002	258.7	@ Moyie confluence - weak
30.474					7/2/2002	258.7	In Moyie, @ pool below staff gauge
30.474					7/6/2002	258.7	At confluence of Moyie
30.474					7/10/2002	259.8	By boat
30.474					7/15/2002	273.0	Above Curley
30.474					7/22/2002	277.8	Moved upstream
30.474					7/23/2002		No loc 244.5-276
30.474					7/25/2002	276.4	Us Leonia bridge
30.474					7/26/2002	275.5	Near boulder
30.474					7/29/2002	274.2	Moved down
30.474					8/5/2002	265.5	Bend above Katka
30.474					8/12/2002	264.7	Below Katka
30.474					8/19/2002	264.7	Below Katka
30.474					8/22/2002	264.9	Below Katka
30.474					8/26/2002	258.5	Moved down to Moyie/Kootenai confluence
30.474					9/3/2002	257.5	Down 1 rkm
30.474					9/9/2002	257.6	Below Moyie, faint

Appendix C. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
30.474					9/16/2002	258.7	Just in Moyie
30.474					9/23/2002	258.7	@ KR & Moyie confluence
30.474					9/30/2002	258.3	Dwnstrm
30.474					10/7/2002	258.3	Same
30.474					10/15/2002	258.3	Same
30.474					10/21/2002	258.3	
30.474					11/4/2002	258.3	Same
30.474					12/3/2002	258.6	Actual date unknown, radio tag found on shore at mouth of Moyie River sometime between 11/4 and 12/3
31.033	581	u	G	11/14/2003	3/14/2001	221.5	Captured in hoop net on 3/12/01; approx. 15 min or so to "knock out" (used clove oil); was gilling pretty slow at start of surgery; sutured muscle layer w/ dissolvable sutures, then skin layer with prolene, some bleeding; fish recovered (i.e. trying to swim in tank) in about 3 (?) min; swam off fine after release.
31.033					3/22/2001	221.5	
31.033					3/28/2001	228.5	Lower Shortys Is.
31.033					4/11/2001	228.0	Lower Shortys Is.
31.033					4/18/2001	228.3	Lower Shortys Is.
31.033					4/25/2001	226.5	Stretch above Flemming
31.033					5/9/2001	221.0	Fischer Creek
31.033					5/31/2001	221.0	Fisher Creek
31.033					6/11/2001	225.0	Flemming
31.033					6/20/2001	250.0	West of Crossport
31.033					7/5/2001	301.2	Up O'Brien ~0.1 km
31.033					7/11/2001	301.1	In KR below confluence O'Brien
31.033					7/18/2001	301.2	Appears to be about 800 ft up O'Brien Cr.
31.033					7/25/2001	301.1	In KR below confluence O'Brien
31.033					8/1/2001	301.0	In KR below confluence O'Brien
31.033					8/8/2001	301.0	In KR below confluence O'Brien
31.033					8/16/2001	301.0	In KR below confluence O'Brien
31.033					8/22/2001	301.1	In KR below confluence O'Brien- good signal
31.033					8/29/2001	301.1	In KR below confluence O'Brien
31.033					9/7/2001	301.2	Up O'Brien ~0.1 km
31.033					9/24/2001	301.2	Up O'Brien ~1.1 km
31.033					10/3/2001	301.2	Up O'Brien ~0.1 km
31.033					10/10/2001	293.3	@ Brush Cr in KR
31.033					10/17/2001	289.5	Downstream
31.033					10/24/2001	290.0	Up slightly
31.033					11/5/2001	290.0	Same
31.033					12/12/2001	287.5	Above Yaak
31.033					12/27/2001	289.5	
31.033					2/14/2002	289.5	
31.033					3/13/2002	289.5	
31.033					4/10/2002	289.5	By air
31.033					4/15/2002	289.1	Above Yaak
31.033					4/23/2002	287.9	
31.033					5/23/2002	289.1	By plane
31.033					6/4/2002	289.1	Just below ruby
31.033					6/10/2002	289.1	Just below ruby
31.033					6/17/2002	258.6	In Moyie 1/8 mi. up
31.033					6/18/2002	258.6	In Moyie 1/8 mi. up
31.033					6/19/2002	258.6	In Moyie 1/8 mi. up
31.033					6/20/2002	258.6	@ Moyie confluence
31.033					6/21/2002	257.4	Also had ang signal at the Powerline 257.7
31.033					6/23/2002	259.0	By boat, moved up
31.033					6/24/2002	258.5	@ Moyie confluence
31.033					6/25/2002	258.7	@ Moyie confluence
31.033					6/27/2002	258.7	@ Moyie confluence
31.033					7/1/2002	258.7	@ Moyie confluence
31.033					7/2/2002	258.7	@ Moyie confluence
31.033					7/3/2002	258.8	In front of Vick's house
31.033					7/6/2002	258.7	At confluence of Moyie
31.033					7/10/2002	258.7	By boat

Appendix C. Continued.

Radio frequency	Total length (mm)	Sex[a]	Transmitter type[b]	Expected tag expiration date	Telemetry date	Location (rkm)[c]	Notes
31.033					7/12/2002	259.5	By boat
31.033					7/15/2002	259.5	Above Moyie confluence
31.033					7/22/2002	263.0	By air
31.033					7/23/2002	270.3	By boat
31.033					7/29/2002	294.2	Below bridge
31.033					8/5/2002	301.2	@ O'Brien
31.033					8/12/2002	301.2	@ O'Brien
31.033					8/19/2002	301.2	@ O'Brien
31.033					8/26/2002	301.2	0.3 mi. up O'Brien
31.033					9/3/2002	301.2	0.3 mi. up O'Brien
31.033					9/9/2002	301.2	0.3 mi. up O'Brien
31.033					9/16/2002	301.2	0.3 mi. up O'Brien
31.033					9/23/2002	301.2	0.3 mi. up O'Brien
31.033					9/30/2002	301.2	@Powerline
31.033					10/7/2002	301.2	@Powerline
31.033					10/15/2002	289.0	Below Ruby Cr.
31.033					10/21/2002	289.0	Below Ruby Cr.
31.033					11/4/2002	289.0	Below Ruby Cr.
31.033					12/5/2002	289.0	Below Ruby Cr.

[a] For sex: m = male, f = female, u = unknown.

[b] A = tag wt 7.35-8.2 g, 90 on/90 off/160 on duty cycle, life of 250 d; C = tag wt 10-11 g, life of 360 d; D = tag wt 18.36-18.81 g, life of 730 d; E = tag wt 25.1-25.31 g, life of 912 d; F = tag wt 20.2 g, life of 690 d; G = tag wt 25.1 g, life of 1000 d; H = tag wt 7.8 g, 90 d on/90 d off/ on until tag dead, life of 250 d; J = tag wt 10.4 g, life of 360 d.

[c] The first location listed for each fish is the release location.

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